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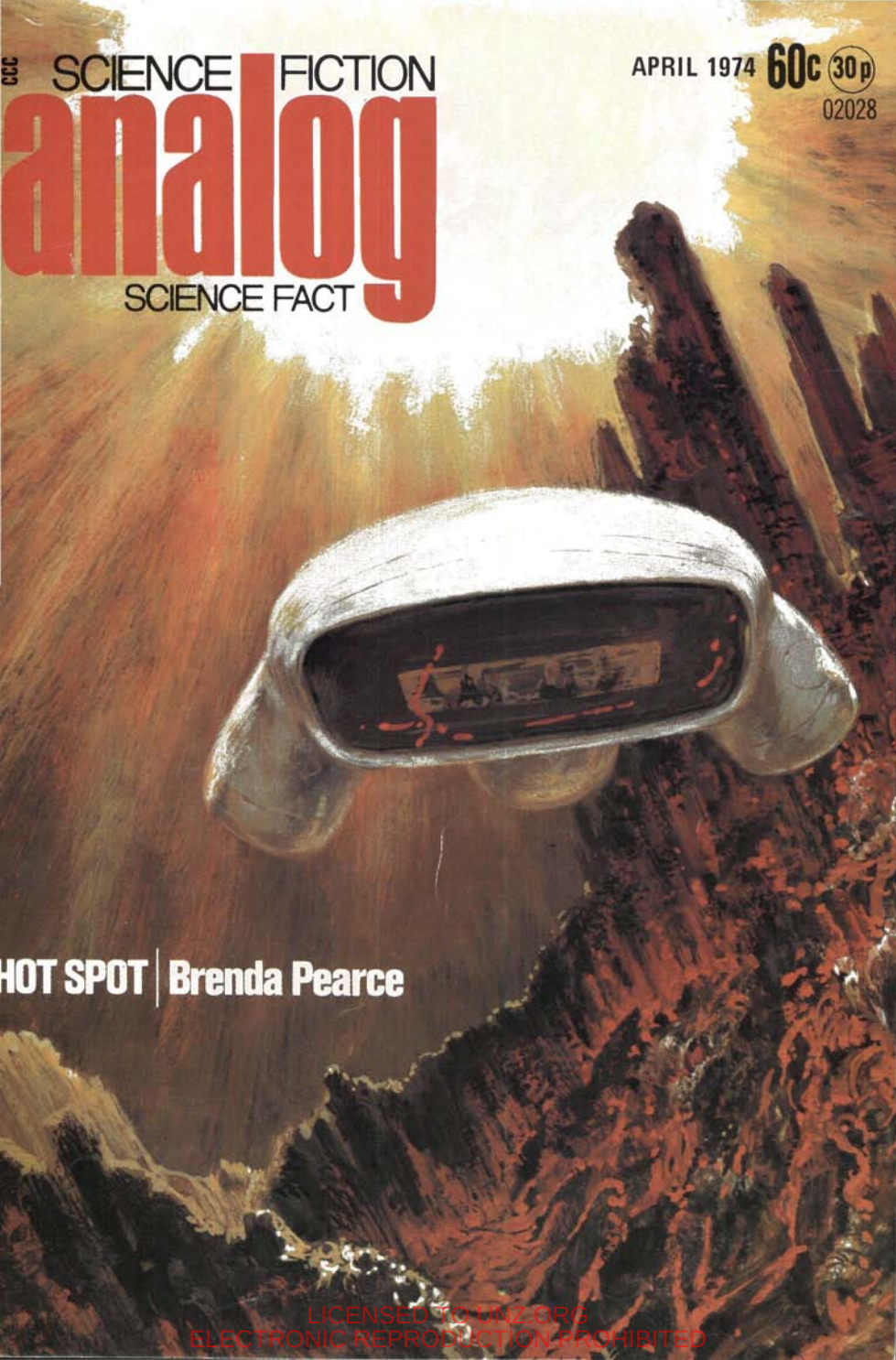

HOT SPOT | Brenda Pearce

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analog

a calendar of upcoming events

April 12-April 14, 1974:
LUNACON (New York Regional SF Conference), Statler-Hilton Hotel, New York City. Guest of Honor, Forrest J. Ackerman. Info: Walter Cole, 1171 East 8 Street, Brooklyn, New York 11230.

EQUICON 2 (Star Trek oriented SF Conference), Los Angeles, California. Guest of Honor, D. C. Fontana; Principal Guests, Mr. and Mrs. Gene Roddenberry. Registration: $10 until April 1, 1974; $15 after. Info: EQUICON 2, Box 23127, Los Angeles, California 90023.

MINICON (Minneapolis Regional SF Conference), Dyckman Hotel, Minneapolis. Guest of Honor, Kelly Freas. Info: Don Blyly, 343 East 19 Street, Apt. 5B, Minneapolis, Minnesota 55404.

April 12-April 15, 1974:
TYNECON 74 (British National SF Convention), Royal Station Hotel, Newcastle-upon-Tyne, UK. Guest of Honor, Bob Shaw; Fan Guest of Honor, Peter Weston. Registration 50p (UK), $2 supporting or $6 attending (North America). Info: Ian Maule, 13 Weardale Avenue, Forest Hall, Newcastle-upon-Tyne NE12 OHX, United Kingdom.

April 24-April 25, 1974:
Aerospace Nuclear Systems for Power and Propulsion, Los Angeles, California. Jointly sponsored by American Institute of Aeronautics and Astronautics, and American Nuclear Society. Info: AIAA, 1290 Avenue of the Americas, New York City 10019.

April 27, 1974:
Nebula Awards Ceremony, Hollywood, California (Science Fiction Writers of America function). Non-members by invitation only.

April 27-May 5, 1974:
Tenth German Aerospace Show, Hanover, Germany.

August 29-September 2, 1974:
DISCON 2 (32nd World Science Fiction Convention), Park Sheraton, Washington, DC. Guest of Honor, Roger Zelazny; Fan Guest of Honor, Jay Kay Klein. Registration: $3 supporting; $5 attending. Info: DISCON 2, Box 31127, Washington, DC 20031.

—ANTHONY R. LEWIS

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mental energy crisis

editorial

"They tell us, sir, that we are weak . . . But when shall we be stronger? Will it be the next week, or the next year?"

Patrick Henry asked that, in his renowned "liberty or death" speech in 1775.

There's a curious echo of this question in the current national dither over the energy crisis.

The mood in Washington is very reminiscent of the combination of gloom and panic that was rampant some sixteen years ago, when the Russians launched Sputnik and established an early lead in the so-called Space Race. There was the same dithering, the same pointing of shaking fingers, the same feelings of fright and frustration, the same scary realization that we were in deep trouble in an area that we had always taken for granted.

It's fashionable to believe—now—that the Space Race was an ephemeral creation of politicians and industrial hacks; that the so-called Missile Gap was a public relations maneuver to win votes and hugely profitable contracts for the aerospace companies. Yet the Race was very real. There was a time when the Soviet Union had nuclear-armed missiles standing ready for flight and we had none. That is part of the reason why we never intervened in the Hungarian rebellion of 1956. There was a time when the Russians were far ahead of us in space feats, and used these triumphs to impress the nations of the underdeveloped world. This was the time when the Russians penetrated the Middle East with technical and military assistance programs. The Arabs were rightly impressed by the Sputniks, Luniks, and Vostoks.

There have been loud cries of despair over the current energy crisis, and equally loud grumblings to the effect that the whole thing is an artificially created problem, a manufactured scare produced by the politicians and the big oil companies, who are manipulating us into allowing the oil companies to raise their prices, escape environmental protection rules, and drill for oil everywhere and anywhere they choose to.

What are the facts?

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Are we truly in a deep crisis, where we will have to drastically change our energy consumption patterns? Or are we being manipulated by a sinister combination of governmental and industrial Svengalis?

Just as in the wildest days of the early Space Race, facts are hard to come by. There's a flood of information, claims and counterclaims, but real, verifiable facts seem extremely rare. Let's get back to the very basic areas, and see what we can learn about the situation.

Basically, our energy systems consist of the following components: fuel resources, such as deposits of fossil fuels (coal, oil, gas), fissionables, or other potential fuels; processing facilities, in which the fuels are prepared for use; distribution systems for getting the fuels from their original locations to the processing facilities and then to the users; electric power plants, where some of the fuel is converted into electricity; distribution systems for the electricity; and finally the myriad end uses of the energy—which range from home heating to transportation to electric toothbrushes.

There is no shortage of fuel resources. By every estimate from any source whatever, the conclusion is that there is enough oil to keep feeding world consumption at its present level for at least another century. But most of the known oil deposits are in Arab lands, and the Arabs are using this resource as a weapon in their struggle against Israel.

To a world that has blithely assumed that Arab oil would not only be available indefinitely, but would be available cheaply, the Arab oil embargo has been a devastating shock. The United States, which now consumes between one-quarter and one-third of the entire world's output of energy, and Western Europe, which is the next hungriest energy consumer, have been especially hard hit.

Although the latest phase of the fratricidal Arab-Israeli war triggered the oil embargo, it seems clear that the Arabs would have been raising the prices of their oil sooner or later. Since the end of World War Two, America and Western Europe have been buying oil from the Arabs at prices that were almost literally dirt cheap. It was inevitable that the Arabs would someday realize how dependent we are on their only export item, and start hiking the prices.

What about other sources of fossil fuel? The US is actually fantastically rich in such resources. True, most of our oil and natural gas wells are being rapidly depleted. Even the newly-developed fields in Alaska's North Slope region aren't big enough to satisfy more than a small percentage of our current consumption. But we have vast coal deposits, both in the eastern Appalachian regions and in western

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states such as Montana, Wyoming and North Dakota. In addition, we have oil shale deposits and offshore oil fields that have not been utilized yet.

In all, conservative estimates show that we have within our own territory fossil fuel deposits that are easily ten times more abundant than all the oil in the Middle East. Enough fossil fuel to keep us going for five hundred years, at least.

But—it's now impossible to use these resources without staggering environmental damage. Stripping the water-scarce western states of their coal deposits could scar those areas permanently. The same would happen if we began digging up the oil shale. And no one really wants offshore oil rigs messing up the beaches where they live or play.

Moreover, much of this fuel—especially the western coal—is high in sulfur. Burning it in power plants, for example, would create serious air pollution problems.

Somewhat the same situation applies to our stores of nuclear fuels, uranium and thorium. We have enough fissionables in our own ground to last not merely for centuries or even a millennium or two; there's enough for a million years, according to most estimates. Even assuming that we don't use breeder reactors to convert low-grade fissionables into high-grade, useful fuel, there's enough uranium easily available for a century or more, at the most conservative estimate.

But again, environmental questions come up. Are nuclear power plants really safe? Can they be operated without creating unacceptable levels of thermal pollution of our water resources?

We have the fuel resources. Whether or not we can use them depends on several factors. It's clear that the big oil companies are using the energy crisis to try to evade the constrictions placed on them a few years ago by an environment-conscious public. The oil companies are saying, in essence, "Let us dig for oil wherever we want to, and stop hampering us with all these frilly considerations of air pollution and environmental degradation, and we'll have everything back to normal pretty soon."

Even if we let them have their way, the one thing that won't be back to normal for a long time (if ever) is the price we must pay for energy.

One of the major reasons for that—and a prime factor in the crisis—is that the United States simply does not have enough oil refining facilities to supply the nation with adequate refined petroleum products.

For decades, the oil companies have consistently "underestimated" the nation's growing demands for oil and its byproducts, and have built refineries at a rate less than the actual growth of demand. This has resulted in our need to import

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refined oil—we actually ship crude oil overseas and then re-import it (our own oil!) after it's been refined.

So the oil companies have not spent as much of their capital on refineries as the situation demanded. The result is that petroleum products are scarcer, in greater demand than ever. So the oil companies are "forced" to raise their prices! Their profits, crisis or not, have been rising steadily.

What about new sources of energy? New fuels? There are plenty of good ideas available, from hydrogen as a replacement for the fossil fuels, through geothermal power, solar power, power from the sea, and—ultimately—fusion power. No doubt all of these will come into use, one way or another. We will have hydrogen-fueled cars and planes someday, and solar-heated houses and office buildings. Much of California could be powered by geothermal energy, and many seacoast areas could make use of the ocean's temperature differentials to create electrical energy.

Ultimately we will have thermonuclear fusion, and when that happens our energy crisis will be solved forever.

But all of these bright promises will take a minimum of five to ten years before they become realities.

Let me tell you briefly about one such bright promise. It's a good example of how this entire energy

continued on page 176

Mental Energy Crisis

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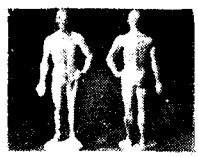

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BRENDA PEARCE

hot spot

An explorer is like a turtle: he can't get anywhere without sticking his neck out.

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I was alone at last, although the noises of the Base still hummed and sputtered in my ears. I switched off the light and groped my way to the neoglass window. As my eyes adjusted, details emerged into the spectral clarity of the months-long night. Unsoftened by any wisp of atmosphere, the stark and frigid landscape gleamed sullenly beneath a sky jangling with stars as sharp and hard as drilling-bits. A strange chill crawled along my nerves, excitement spiked with fear. Here was I, gazing upon the nightside of Mercury, the inmost and smallest of the solar planets: a brutally hostile, deadly little world sweeping an eccentric orbit around a monstrous sun.

The door behind me opened. A click, and the room exploded into light. I blinked, blinded; then turned.

"You must be Dr. Collins—Christopher Collins?" said the gray-uniformed, prematurely gray-haired stranger who filled the doorway.

"Yes," I replied.

He moved forward, light-footed for his bulk. Without ceremony he introduced himself: Commander Peter Craig, United European Space Service, Mercury Base Three. He was in command of the two-pronged project nicknamed "The Hot Spot Expedition." One prong was purely scientific: to investigate the nature of subsolar volcanism during perihelion passage. The other was more immediately practical: to confirm the existence of rich deposits of uranium in the hot spot regions, and to pinpoint their positions so that the precious element could be extracted by night-side teams and shipped to our uranium-hungry Earth.

Craig chuckled. "One thing we're indebted to you for: the stink you kicked up when you learned of our obsolete equipment! Thanks to you, we've at last been given what we need to bounce Mercury back into the limelight where it belongs."

"I'm glad," I said, and meant it. Mercury Bases One and Two had been closed down long ago, and Base Three starved of funds for years.

Craig fell silent, then: "This is not your first trip off Earth," he stated.

"No," I agreed. "I've worked on Saturn's moon, Iapetus, and in the seismically active regions of Mars."

"Titan? Weren't you there with the Heilbron Expedition last year?"

"No. I couldn't make it."

"Why not?"

"Broke my leg."

"How?"

"Slipped on the ice on Erebus."

Craig laughed. "Teach you to go scrambling around on Antarctic volcanoes!"

"A geologist goes where he's sent, on Earth or off it," I retorted. I had a guilt complex about that leg. I'd broken it through staying too long in an unstable zone, pok-

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ing instruments down smoking fumaroles; I'd had to bolt for cover.

Craig turned to the window. The vivid blue eyes set deep in his glare-bronzed face narrowed as he scanned the darkness outside. His size made me uncomfortable. I'm a small man, wiry and agile, with sandy hair and eyes to match. Beside this giant I felt microscopic.

Craig said idly, "When I came in, you were standing here with the light off. Does Mercury impress you?"

"Very much," I answered truthfully. Some quirk of temperament ensures that the more I travel the keener grows my zeal to explore strange places and unravel new mysteries.

With shocking abruptness Craig's manner changed. "That's what I feared," he said. "Dr. Collins, I know your reputation. You're damned good at your job—you wouldn't be here if you weren't!—but you take hair-raising risks. So far you've got away alive though not always intact." His voice became velvet over a razor blade. "Here you will behave more sensibly. Mercury is a killer planet. One act of folly on your part, and you'll throw away men's lives and equipment worth millions. Men can be replaced, including you. The equipment is irreplaceable. There will be no heroics. Do I make myself clear?"

He did. I could not tell him so; the unexpectedness of his attack had stolen the air from my lungs. I felt my face grow pale with shock and rage. No one had spoken to me like this in years.

As for his earlier questions, so innocent, so friendly, how I had been deceived! Craig had asked them, not to toss a social hand-line, but to provide a launching pad for his savage little homily.

Craig gave a sudden boyish grin and slapped me lightly on the arm. "Enough. Time to visit the daysider, check your gear, meet the crew. But first, may I give you a final word of advice?"

Hoarsely I forced out: "If you must."

"Stop gaping at me as though I'd sprouted horns and a tail!"

Seconds later Craig was striding to the door. I struggled to arrange my expression to show bright good humor, and hurried after him.

The crew of two was already aboard the daysider, an exploration vehicle designed to operate in full sunlight. Safe in its shielded entrails, I would be borne to the hot spot tomorrow, Earth-time.

Inside the air lock, Craig helped me off with my borrowed spacesuit. I tested my legs and noted with relief that the gravity generator was switched on and I was my own natural Earth-weight. I breathed air redolent of oil and warm metal. I listened to the two voices dropping clearly from the intercom, which

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someone had left open . . . one voice, to be exact: a monologue punctuated by the hearer's ribald guffaws.

"So I said to her, 'Look, pussycat, six times in two hours is more than enough. I need to recharge my batteries. I want to sleep. Move over.' "

These bedtime antics were related in an English too impeccable to be the speaker's native tongue. The storyteller must be our navigator, Giovanni Ricci: one of the Italians among the multilingual Mercury Base personnel.

"Alas," continued Ricci with an elaborate sigh, "she refused to budge. She wanted to cuddle me, she said. 'But,' I protested, 'you're wrapped around me like an octopus. That's not cuddling. That's sheer bad manners.' She replied that she was demonstrating her undying love. I was flattered—until the truth dawned: she wasn't cuddling me because she loved me but because she was cold." Ricci's light attractive voice throbbed with indignation. "Know what she said then? 'Swap sides with me, *carissimo*. I'll warm your half. You warm mine.' The cheek of it! My half was warm already. Hers was freezing. I refused, of course. I rolled over, wedged my bottom against her tummy and shoved."

"And did it work?" That was presumably our engineer, Mark Anderson. He was spluttering with mirth.

"Alas, no. We were both in her half all along. My shove gave birth to the most frightful commotion. I'd heaved her onto the floor."

Having stowed our spacesuits, Craig led me along the passage from the air lock to the control cabin which filled the daysider's forward end. Ricci and Anderson sprang to their feet as we entered. Craig introduced them. Young men, both: Ricci, dark and lithe, with a sallow fine-boned face and eyes so deep a brown that they looked, in the artificial light, like pools of pitch; and Anderson, built like a boxer, stolid and square, with a fuzz of fair hair matting his wrists and curling from the V of his uniform collar.

"To work," said Craig briskly.

Suppressing a surge of excitement (I love my job), I set about preparations. They should have been simple: to check the equipment installed for my use. There was just one snag: space—or rather the lack of it. How severe that lack was would soon become dismayingly clear.

"No, Dr. Collins, I'm sorry, but you can't," said Craig, seating himself in the pilot's chair and eyeing my contortions with misgiving.

"Can't what?" I asked.

"Park your gear so close to the window. It's blocking my view. I'm piloting this sardine can, remember."

I stopped short. It was true: my bulky instruments were festooning

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the heavily reinforced neoglass window which gave forward vision to pilot and copilot—except that on this trip we would carry no copilot. I would be using his chair; no other arrangement was workable.

I reshuffled my apparatus: large items to the wall, small items to the front where I would have them comfortably to hand . . .

"Sorry, Doctor. No. I've got to be able to reach the controls. I can't if all the time I'm bashing my fingers on some gadget of yours that's in the way."

I scowled at the control board stretching the length of the wall below the window. I moved my instruments again.

"Whoa, Doctor! Stop! That's Ricci's table. Tomorrow it's going to be covered with navigation charts."

I glared at the table almost touching the backs of our chairs, and exploded. "All right, Commander, *you* tell *me* how the hell I'm supposed to manage if I can't have my gear *anywhere* within my reach."

"Stow it beside your chair—"

"I can't. There's no room."

"Of course there isn't! The daysider wasn't designed to hold all this newfangled equipment. Make room as best you can."

"How?" My voice rose half an octave. My hands waved wildly at the instruments cluttered around me, each bristling with sharp projections and snakes' nests of cables looping to the wall. "If I leave my stuff where it is, I'll be zipping about like a squirrel in a net. I'll bruise myself black and blue. I'll strangle myself in all those bloody cables—"

Craig's voice boomed out, drowning mine: "Too bad, Doctor, but you'll have to cope. Somehow. So will the rest of us."

Silence descended, breached by muffled merriment from Ricci and Anderson—merriment which fizzled out under a single stern glance from Craig, who brooked no insubordination.

Eventually my apparatus was checked and arranged as conveniently as the cramped space allowed. I sagged wearily into the

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copilot's chair. Craig produced a flask of hot coffee. Politely he offered me some. Politely I accepted, reaching to receive a large mug filled to the brim.

"There are four exploration vehicles, are there not—two daysiders and two nightsiders?" I hoped a light remark might thaw the chilly courtesy which threatened to asphyxiate us.

A *frisson* rippled through the cabin. My companions were momentarily as still as stalagmites. The *frisson* passed. Craig said easily, "There used to be. One daysider went missing. Didn't you read about it in the papers on Earth?"

Of course I did, I recalled too late, and cursed my thoughtless blunder. I buried my embarrassment in my coffee, gulping so deeply that I scalded my mouth. I mumbled, "I believe I may—"

"This was two perihelions ago," Craig cut in, perhaps to sidestep further awkwardness. "Our sister craft set out to make a hot spot crossing. She never returned."

"What happened to her?"

"No idea."

"You must have some theory, surely?"

"None, Dr. Collins. I headed the search for her myself, in this craft. We found no trace. But"—Craig's gaze locked on mine, grim and very clear—"she had a competent and careful crew. Whatever happened, those men died through no fault of their own."

You take hair-raising risks. There will be no heroics. I stiffened. If Craig dared to tongue-lash me with Ricci and Anderson lapping up every word . . .

"You're spilling your coffee," warned Craig.

I righted my tipping mug, and swore at the brown stain spreading along the hem of my clean white overall. To have been harangued as though I were a naughty child—and for nothing! I *never* take risks. Well, only when forced to by the nature of my work.

Lifted by gravity-neutralizing motors safely above the fissured ground, the daysider whined through the night. A fan of light illuminated the route ahead. Beyond the fan a lake of radioactive dust flared into sickly fluorescence, then faded. A mineral outcrop crept into a corner of the fan and burst into prismatic sparks. The terrain spoke of immeasurable age battered by extremes of temperature, alternately frozen and superheated as Mercury turned its airless face slowly, very slowly, from the bitter cold of the nightside to the blowtorch glare of the sun.

The Hot Spot Expedition was under way.

I sat quietly in the copilot's seat. Craig filled the chair beside me, his powerful hands riding the controls with casual ease. Behind us Ricci rustled navigation charts, his cleanly chiseled face relaxed yet

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alert under its cap of sleek black hair. Anderson was absent; he was supervising the engines tucked away in a compartment beyond the washroom, to the rear.

Craig broke the silence. "Dr. Collins, we shall be flying on instruments only for the next half hour."

"Why?" I asked.

"We're approaching the terminator—the dividing line between day and night. In a few minutes the sun will appear on the horizon ahead. We'll be flying straight toward it."

I tensed. With straining eyes I probed the darkness in front of us. Darkness? A cone of pearly luminescence stabbed up from below the horizon. Lengthening rapidly, it arrowed into the sky. I had seen it from Mars, this zodiacal light, but never so magnificently. So brightly it glowed that the ground itself reflected a pallid shine.

Moments later a brilliant haze limned the ragged skyline. It arched upward, spread, intensified. "The sun's corona," Craig told me. "The sun itself will follow." He pressed a button. A glittering shutter of heat-shield material sank silently over the outside of the window, chopping off the view. It would stay lowered until the sun had lifted high enough to be above our line of sight.

Craig studied the control board, concentrating on a small color-television screen inset among the dials and switches. I eased forward and saw why: the screen gave a view to the front. I examined it . . . and felt the breath lock in my throat. A blazing bow had reared beneath the arch of the corona, dimming it to a ghost. The body of the sun was rising. More and more of it kept coming; it seemed to have no end. Sluggishly it heaved itself into the sky, annihilating the last few faded stars.

Details from my briefing lunged to the forefront of my mind. Mercury was now at perihelion, that point along its lopsided orbit where it whipped in closest to the sun. For many Earth-weeks past the sun had been growing larger and larger as it crawled up the sky. It was hovering now at the zenith, swollen to its most immense size. Hovering? Like a fiery pendulum it had reversed its motion and swung backward for a fortnight before resuming its forward path.

Under that thrice-crossed zenith lay the hot spot toward which we were traveling with such crazy confidence.

The hot spot: one of the two which Mercury bore on opposite sides of its equator. At alternate perihelions, each crept vertically under the sun and shuddered into volcanism—volcanism which crescendoed to planet-bursting violence during the period of greatest heat.

With a hideous shock the full realization punched home: *this* was

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the period of greatest heat; *I* was racing to the hot spot; *I* would soon be pinned between that gigantic fireball and the flaming cauldron of the land . . . with no shelter, no shadow to creep under for safety.

Safety? One daysider had been lost already, two perihelions ago—lost, therefore, in the region I was to study; lost without trace. In other words, rendered unrecognizable by the manner of its destruction.

The cabin seemed suddenly like the inside of a runaway nuclear reactor. As inconspicuously as possible I eased my collar from my throat, then rubbed my hands down my overall.

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"Cheer up," said Ricci behind me.

I started convulsively; turned.

"It catches all of us like that the first time out," Ricci explained, and flashed me a wicked grin. "Er– your elbow is about to poke the glass out of one of your gadgets."

So it was. I jerked back my arm, appalled at the prospect of damaging my precious equipment.

Craig pressed a button and the segment of heat-shield covering the window rose. I looked out on a furnace landscape, parched and crumbled. Shadows sprawled across it like accidents with ink.

In quick succession Ricci gave out several course corrections. Craig followed them, then thrust a lever hard down to the floor. Mercury began to glide more swiftly beneath us. The shadows grew shorter, the stonescape still more flayed and agonized. Like madmen seeking the most frightful stage for suicide, we hurtled toward the hot spot which lay impaled under the vertical blast of the flamethrower sun.

"Prepare yourself, Dr. Collins." Craig's prosaic voice helped me to shake loose from a state of uncomfortable tension. "Shortly we shall enter the volcanic zone."

I bounded from my seat. With hands that trembled slightly I prepared my instruments for action. The polished coolness of their planes and edges comforted me. I slid my fingers over them with almost sensual affection. Cameras, recording equipment, spectroscope, gauges and meters of various kinds, monocular: all would soon yield sweetly to my will.

Sometimes I have an uneasy suspicion that I prefer things to people.

There was no definite boundary to the hot spot region. Suddenly and unmistakably we were over it. I set the cameras whirring and leaped for the spectroscope, bruising my knee on the corner of my chair. "Slow down!" I cried in anguish. "All I'm getting is a blur!"

Craig said reasonably, "I thought you wanted to make a systematic scan, starting from the center."

"I do, but don't let's rush it. A slow approach will give me a chance to get the feel of the place before I begin."

We slowed down.

The volcano-scape flared all around us. I squeezed past my apparatus and glued my nose to the window, backing off smartly when I found that it was hot. Warily I edged forward again, trying to examine the details outside. The neoglass was darkened and polarized. Even so, a sizzling, upward-striking light slammed into my eyes: the reflected radiance of the vertical, perihelion sun.

Craig's voice roused me. "Dr. Collins! *Dr. Collins!*"

"Yes?" I said absently.

"It's unwise to stand so close to

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the window. The glare can hurt your eyes."

I stiffened into full attention. "But I'll need to be close to it from time to time. That's part of my job."

Craig opened a locker in the wall beside him. He groped within, produced a pair of dark glasses. "Wear these," he said. "And keep back from that window as much as you can!"

I perched the glasses on my nose—a button nose with a dent where the bridge should be. Again I studied the view outside. The lenses cut its intolerable brilliancy.

I moved to the tectonic strain gauge, an instrument designed to measure strain in both surface and subsurface rocks without physical contact with either. I stooped to read its dials. The glasses slithered down. I shoved them back, smearing one lens with an impatient finger. The dials were meaningless shadows, their needles darkened to invisibility. I whipped off the glasses and tried afresh. This time the needles stood out clear—and quivering. Their agitation warned of tremendous stresses striving to rip the crust asunder.

Impressed by the magnitude of the forces at work, I turned once more to the window and peered out, frowning in concentration. I found myself chewing the earpiece of the glasses. Guiltily I slipped them on again. Both lenses now were smeared.

We were skirting a cluster of volcanic cones. Ash-gray, leaning at impossible angles, they reared from a floor which blazed white and pale orange hundreds of feet below. Above them boiled thick gritty clouds whose undersurfaces smoldered redly with the reflected glare. Constituent particles soared and plummeted in the low-gravity vacuum. The clouds staged a nightmare spectacle of fiery towers writhing between the tar-black sky and the incandescent ground.

"May we fly between them?" I asked. "I'd like a trial run to make sure that no unforeseen snags emerge."

Craig's cheek muscles twitched. He seemed on the point of refusing, then: "Very well," he said.

Cautiously, very cautiously, we threaded between the cones. I put my instruments through their paces. They functioned splendidly. Gripped by excitement, I called to Ricci, "Got the position logged?"

"But of course," the cheeky devil answered. "Er—you're shedding those goggles again."

True. The wretched things had skidded down my nose like toboggans down an ice run. Swearing, I rescued them.

"Getting the feel of things, Dr. Collins?" Craig inquired. He sounded amused.

I halted abruptly. I had almost forgotten that Craig was our pilot. I had been flitting around him, buffeting him with my apparatus,

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breathing heavily in his ear. "Thank you, yes," I replied, ruefully aware of error. One snag did exist: my own excitability. In future I must remember to flit with care.

A nearby cone blew itself silently to fragments. Craig yanked levers. The daysider skipped nimbly out of the danger zone.

"Jesus," I murmured when my voice returned. "Does that happen often?"

"We don't know," said Craig. "One needs to be perpetually on guard."

Ricci added slyly, "One needs also very much *not* to have a nervous disposition!"

A muscle bunched in the corner of my jaw. Some people think, quite wrongly, that I have a nervous disposition. I realized that I didn't like Ricci, not at all. He was too knowing, too insolent.

I must be honest: my dislike stemmed from a core of plain old-fashioned jealousy. I resented Ricci's Latin good looks and air of sexual assurance. I recalled the bedroom adventure which he had described with such hilarity. I would have liked to chalk up similar exploits. I would have liked to tell naughty tales of my virility. I would have liked to be a wow with the ladies.

Pipe dreams. I've always muffed my contacts with women. I'm sensitive about my smallness. I can't dance. My attempts at cocktail party chat undergo a sea change into lectures on geology. I watch female interest fade as, helpless, I wax more and more abstruse. Female eyes glaze with boredom. Surreptitiously but with mounting desperation they search for a rescuer. A rescuer invariably appears, and my latest conquest wafts away with insincere murmurs of regret.

Mercury rolled below, convulsed. Despite the dark glasses, my eyes itched and stung as I scanned that riot of lethal light. I rubbed them fiercely and carried on, determined not to let physical weakness interfere with my enthralling work.

Twice Craig warned me away from the window.

I was adjusting to Mercury's bizarre violence, although I was no closer to explaining it away. Eons ago, this vicious little world should have quenched the last of its volcanoes. The question niggled like a sore tooth: why had it not?

Regretfully I thrust speculation aside. The time had come to begin the systematic scan. Craig nodded when I told him. Ricci looked up with a sardonic glint which plainly stated, *High time too!*

The daysider sped the rest of the way to the hot spot's center. Ricci's most exacting task now began. As navigator, he was to guide us out in a pattern of expanding squares which would cover every yard of the terrain.

The daysider floated forward, its path making right-angle turns fre-

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quently at first, then less and less often. I set my instruments to make broad slow sweeps across the searing white and yellow expanse. Here and there darker features glowed in all shades of red from cherry to charred crimson-black. Their outlines were indistinct, for they cast no shadows under the pounding radiance of the vertical sun.

I examined the terrain. I studied the printouts from the recorders. I took readings from my instruments. I marked the sites of radioactive ores. Gradually, gradually, the dim outlines of a chaotic picture began to emerge. Sharp discontinuities and fluidic mergings: they were not arranged in an orderly manner; they were jumbled higgledy-piggledy as though a giant spoon had dug deep into the crust and stirred with stupendous strength.

Three hours slipped past. We glided over a region of overlapping craters. I swung the monocular into position—a useful gadget, like a short-range telescope on a jointed stalk. I adjusted its focus, increased its magnification, squinted into it painfully. Long since I had abandoned my dark glasses. Their lenses were a mess of smudges. Cleaning them was useless; each time I put them on, they steamed up within seconds.

Grotesquely magnified by the monocular, the craters wavered in the heat-glare. They looked wrong somehow. I bent over my instruments. Their readings indicated an increase in gravitational pull over this region. The direction of pull was measurably out of alignment with the gravitational field of the planet as a whole. A mascon lay hidden underground- a mascon fizzing with hard radiation. Uranium! The mascon was riddled with the stuff, begging to be mined and ferried to power-starved Earth.

Enough. I needed no more at present. Detailed analysis must await my return to Europe.

I straightened and kneaded the small of my aching back. I frowned through the window, studying the patchwork of ruined craters. An obscure pattern seemed to underlie their subtle wrongness. Could this

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entire zone, mascon and all, be one monstrously huge, inactive caldera?

Inactive? On Mercury, near the center of a hot spot, at perihelion?

I made a dive for the strain gauge, read its message frantically. And read it again, unable to believe my eyes: the needles were like live things demented with terror, striving to burst from their confinement and go whirling off the ends of their scales.

Before I had time to yell a warning, Craig sent the daysider shrieking upward into the ebony sky.

Ricci grabbed the edges of the navigator's table to keep from being hurled from his seat. One of his nails tore; I saw blood bloom brightly on his fingertip. He sucked it, inspected it, asked casually, "Why did we do that, sir?"

Craig's answer was terse and grim: "I'll show you." He swung the daysider around in a tight circle, stationed it well above the rim of the caldera. "Look down there."

Ricci half rose to see over Craig's shoulder. "Mother of God!" he breathed, and crossed himself rapidly.

Craig flicked on the intercom. "Anderson! Are the engines all right?"

A box on the rear wall crackled a reply, a brief splurge of technical details which amounted to "More or less."

I stood riveted to the spectacle beyond the window. A rift had burst open in the caldera's crater-pocked floor. Duty belatedly galvanized me into action. I sprang to my instruments. Even as I struggled to adjust them the chasm went on opening, wider and wider, jagged and enormous. Superheated gas and steam puffed out and dissipated in seconds. Dust and debris hurtled up at us, smashed down again to form a thickening carpet of slag and cinders.

Lava welled up in the rift; overflowed. A scalding torrent of liquid rock seethed out as freely as boiling water. It lapped around the crumbling rims of disintegrating craters. It tunneled under loose-lying ash, gulped beds of flickering embers. It sank again. The walls of the chasm reappeared, slimy-bright and dripping. Incandescent lava still gouted from innumerable tiny vents and fissures.

My instruments could not operate accurately from such a height. "Go lower! Go lower!" I shouted.

"No," said Craig.

"For Christ's sake, do as I bloody say! Every second I'm stuck up here, invaluable data is lost. That rift is being acted upon by colossal, ever-changing pressures—"

"Exactly," Craig agreed dryly. "That's why we're not descending."

"But such an opportunity may never recur! You're wasting—"

"No!" It was point-blank refusal.

I gritted my teeth in fury.

"I'm responsible for your safety," Craig reminded me.

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"To hell with safety. I've got a job to do! I can't do it if you whisk me away the moment things get interesting. I need to be right up close to record—"

"Shut up!" roared Craig.

I shut up, but merely to marshal a new, more telling, blast.

Craig gave me no time to start again. "You're welcome to kill yourself," he said with brutal bluntness. "But you'll do it on Earth, not here. We've lost one dayside already. You're not murdering this one's crew."

I subsided. I was shaking.

Ricci grinned, openly enjoying my skirmish with the commander. I'd have wiped that smirk off his face with my fist, had civilized conventions not restrained me.

We continued with the systematic scan. It wasn't easy. My work demanded steady hands. Mine were slippery with sweat and, ten minutes later, still quivering.

Craig cleared his throat. "Tell me, Dr. Collins"—his voice carried just the right degree of interest—"have you hatched any theories yet to explain Mercury's volcanism?"

I forced my mind into clinical detachment, hunted for words which a layman would understand. "It must be something to do with the nearness of the sun. At perihelion particularly, the sun's gravitational pull is tremendous. It must set up intolerable stresses in the planet's crust." I was warming nicely to my subject. Enthusiastically I continued: "Even if Mercury lacks plates of the terrestrial kind—and the evidence suggests that it does, although it may have some other mechanism to take their place—gravitational strain could set up tidal movements in the crust. This could riddle the hot spots with active quasi-plate boundaries. Friction would generate heat enough to melt the underlying rocks into magma. Sections of the crust would grind together, or dive under each other, or stretch apart allowing mantle material to well up under explosive pressure. Mascons would form—that is, massive concentrations of dense and heavy material gathered in pockets below the surface." I pointed to the printouts. "Those things imply that the mascon associated with our rift is rich in uranium ore. If it can be mined while the hot spot traverses the nightside . . ."

"Whoa, stop, stop!" Craig protested, chuckling. "You've lost me. I can't follow—"

"But it's so simple—"

"To a boffin, perhaps. Not to an old space dog like me."

Suddenly I felt like a fish, airborne and floundering. Once hooked by one's own eloquence, it is incredibly difficult to let go. I managed it somehow, and resolved to be more wary in future. If I could learn to refuse the bait, I might—just might!—avoid transformation into a raging bore.

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Later, much later, I remembered that Craig knew more about Mercury than I did. All Space Service personnel were grounded in planetology. Craig would easily understand the weird effects of this killer world's eccentric orbit. With a shock I saw how skillfully he had handled me. His question had been designed to soothe my tight-strung nerves.

Another hour crawled by. Fatigue was beginning to blunt my reactions, to suck skill from my fingers and clarity from my mind. I wiped my sleeve across my smarting eyes and told Craig that a brief rest was essential.

Craig set the daysider to hover high above the treacherous ground, then paced the cabin, easing his cramped muscles. Ricci fetched sandwiches and coffee. I flipped through the printouts, partly to quench my curiosity, partly to insure that adequate data was being recorded. It was; the information on these tapes would fuel fierce battles among the experts for years.

I put the printouts aside. It was time to get on with the job. The daysider swooped down. We spent a further hour gambling for knowledge with our lives.

I became aware of Craig and Anderson talking on the intercom. The words *refrigeration unit* were tossed to and fro. Ours was apparently on the blink, but Anderson was nursing it along. I listened, but soon ceased to pay attention. Something odd was registering on the instruments.

"Ninety degrees to starboard, sir," Ricci told the commander.

"Cut forward motion and hover," I said in the same breath.

The daysider slid smoothly to a stop. "Found something interesting?" asked Craig.

"I'm not sure. I'm trying to pinpoint it." A few minutes later, "Got it!" I announced with satisfaction. "Can we go down closer?"

We could and did, after a flurry of confusion when my directions proved off-beam.

We hovered a hundred yards above the anomaly. I squeezed past my equipment and pressed to the window, as near as its heat allowed. I squinted down through screwed-up eyes, probing a desert of rubble rotted and half liquefied by the unshielded radiation of the gigantic sun.

"See anything?" inquired Craig. Long since, he had given up trying to persuade me to keep back from the window.

I shook my head. "No, there's nothing to account for the readings I'm getting. Nothing visible, at least."

"I might be able to help if you explain your readings. Can you, without getting too technical?"

I pondered. "There's something down there which doesn't belong," I said at last. "Listen: suppose on Earth you get a limestone plateau with a bloody great lump of chalk

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in the middle. The nearest chalk outcrops are fifty miles away. You wonder how the chalk got there, right?"

"Right," Craig agreed.

"On Earth, of course, the chalk could have been moved in dozens of ways—by mankind, for one. Mercury's dead, however; we and the Base personnel are the only living beings here—unless you believe in ghosts!" I added with heavy jocularity . . . and trailed off abruptly.

Craig's vivid blue glance flicked to my face. He made to speak and checked himself at once.

My feeble attempt at wit had sparked a strange unease in me. What had I told Craig? Nothing momentous; merely a stupid crack about ghosts . . .

Ghosts on Mercury. Of what—or whom?

My fingers crisped on the window-frame, clutching so tightly that the nails whitened. I stared out. The wasteland stared back at me, flashing a million scalpels into my eyes.

I blundered among my apparatus, examining meter readings with feverish haste. Clumsily I detached the printouts from the recorders. I juggled mentally with neat columns of figures and symbols. The anomaly stood out starkly, all the more starkly because the area was passing through a quiescent phase. Not that such a phase could last for long; inexorable pressures underthrust the entire region. The recent past must have seen scarifying tectonic upheavals.

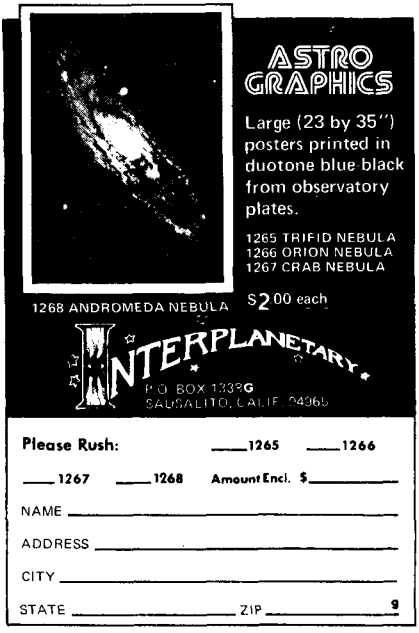
I returned to the anomaly. Slow-witted with tension, I analyzed the elements which composed it. I fitted them together jigsaw-style, seeking connections, trying to construct an orderly whole . . .

Every drop of blood drained from my face; I felt it go.

Craig snapped out crisply, "Well?"

I turned my head away, half hoping to disguise my reaction.

Craig was not fooled. His voice hardened: "Come on, man, spit it out. You've gone as white as paper. Why?"



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I said, "I've found your missing daysider." My voice sounded absurdly conversational.

"Where?"

"Down there."

"Show me."

I turned back to the window. I raked my gaze over fuming mineral pools and glutinous boulders. Somewhere among them was the wreck of the daysider. I could not find it. My eyes burned and watered. The stonescape began to waver, distorted by the tears clinging to my lashes. Pools and boulders took on an eerie beauty, rippling and sparkling, alive with iridescent light. I dried my eyes roughly on my sleeve and tried again. Slowly, carefully, shifting from blob to viscid blob, I searched that scene of hideous desolation.

I failed. I checked my instruments, trying to fix the daysider's exact location. I looked through the window again. And shivered.

Craig said quietly, "You've spotted it, haven't you? Show me."

I bit back horror. "I can't."

"Why not?"

"You won't recognize it. It doesn't look like a daysider any more."

Silence clamped down, brief but heart-stopping.

Harshly Craig ordered me: "Explain yourself."

"Very well. The daysider has fused into the ground. The upmost rock-layer is partly fluid and partly plastic, you know, and reaches appallingly high temperatures. The daysider must have crash-landed and sunk in. Direct contact with the ground has melted it, little by little probably, from the bottom up. The heat-shield is still intact, but discolored and sagging out of shape. One more perihelion passage should finish it altogether."

I stopped. I swallowed painfully. "In future it might be better to extend the heat-shields under the daysiders. That would protect their bottoms from the ground as well as their tops from the sun—" I fought rising nausea. "Oh Jesus no! A daysider crashes, it's doomed! The crew can't escape. They're trapped. They fry. Protection would spin out their agony—"

Craig sliced a hand down, cutting me off sharply. "Thank you, Dr. Collins. You can leave the rest to our imaginations."

Ricci's voice sounded behind us, unnaturally subdued: "What could have caused the crash?"

Craig cocked a grizzled eyebrow at me. "Any pointers to that?"

I studied my instruments. "No. This area's quiescent—that is, it's as quiescent as any part of a hot spot can be. Of course, two perihelions ago, things were likely very different. A rift, a range of volcanic vents: if something of that sort opened up, the daysider could have been knocked out of the sky by flying debris, as we so nearly were . . . wait!"

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"He's off again," murmured Ricci. He had shaken off the frightfulness of his colleagues' fate with disgraceful speed.

I combed the area yard by yard. There was no evidence of volcanic vents or cones in the immediate vicinity. A rift, therefore: it had to be a rift. There was no rift; but there was another mascon. I thought hard: *Rifts can close as well as open: so, search for traces of a closed rift . . .*

Tensely I turned to Craig. "Commander, can we circle this spot slowly?"

Craig nodded. "If you wish. But make it snappy, will you? Time's running out."

We circled. Ricci, teeth clenched, tried to keep track of our wayward meanderings. I hunted dead or dormant rifts. The sheer fascination of the task soon claimed me heart and soul. All other considerations faded and fled before the juggernaut of intellectual delight.

I found what I sought. "There!" I exclaimed in triumph.

"Where?" asked Craig.

"To our left. See that seam in the ground, running diagonally toward that clump of crystals?"

"Crystals?"

"Yes. Look, over there: see where I'm pointing? Giant crystals, scintillating like jewels, every facet ablaze. Can't you see them?"

Craig frowned. "I see the crystals. But no seam."

"Well, it's not exactly a seam," I admitted. "It's a very faint, puckered, waggly line, smudged in places and nonexistent in others. According to my instruments, it marks the site of a closed rift. Not too recently closed, either, or all trace of it would have vanished. What's the betting it burst open two perihelions ago?"

As I spoke, shock hit me, shock at my blithe and gleeful tones. This was the rift which might have destroyed a daysider, might have condemned my fellow human beings to a lingering, agonizing death on this nightmare world millions of miles from home. Ashamed, I added soberly, "I'd appreciate a closer look at it. May we go lower?"

Craig slanted me a narrowed glance. "Is it safe?"

"Yes, as far as anything's safe here."

"Check your strain gauge."

"I just did. The needles are fluctuating, but not over a dangerously wide range."

We floated down to a point some fifty yards above the seam. With difficulty we tracked it, losing it from time to time and casting about to pick it up again. On one of these casts, I noticed a curious shadow on the ground.

"Hover," I said.

We hovered.

I peered into the monocular. Scorching radiance lashed back at me. My eyes had taken such a battering from the reflected sun-glare

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that they had lost all sensitivity. I could distinguish no details at all.

I pushed the monocular aside. "We'll have to go lower," I advised.

"Is it absolutely necessary?" asked Craig.

"I'm afraid so. There's something down there and I can't make out what it is."

"Your instruments will tell you."

I checked their readings. "They don't. All they show is a gravitational disequilibrium indicating a mascon below the surface. That shadow doesn't register at all."

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"Then it's probably nothing." Craig sounded almost relieved.

"Nonsense," I snorted. I scowled at the inexplicable patch, dark only through contrast with the searing brightness all around it. "That shadow may not register because it's so small: nine or ten inches wide . . . and situated plumb on the seam." Excitement dried my mouth. "That means it must be connected with the rift. A *shadow?* It can't be a shadow, there's nothing to cast it. It must be—hell and damnation, I can't investigate it from this height. *Please* go lower!"

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"No, Doctor. It's too risky."

You take hair-raising risks. My lips tightened at the memory of the rebuke. "Commander, this entire expedition is one big risk. If danger frightens you so badly, you should have stayed at home. The hot spot is no place for a coward."

Craig flushed. "It's common sense guiding me, not cowardice."

"Then common sense should tell you that, in a stable zone, one may approach the ground in relative safety." I smiled at him. "Besides, you're forgetting: I'm the expert. I'm the one who knows what's safe and what's foolhardy. Now, will you let me do my job?"

Craig went very quiet. "All right," he said eventually. "As you say, you're the expert. But I think you're making a mistake." He concentrated on the controls.

I was elated with my victory . . . then.

The daysider drifted down another thirty yards. The shadow clarified into a perfect circle of red-tinged darkness.

"It's a vent," I said. "No wonder the instruments ignored it! They can't look into it. Nor can I. We're at the wrong angle. Can we move forward a little?"

"Madness," muttered Craig, but he took us forward. Now, at last, I could examine the vent properly. I set the recorders going, tucked myself into a corner by the window. I gazed down the narrow gullet. It plunged into the incandescent crust as straight as a die, dragging my sight down and down into a rich and glimmering blackness.

I surfaced and gave Craig a wry wisp of a grin, regretting my malicious attack. "I'm sorry, Commander, but I'm going to bash you."

For the first time I saw Craig startled out of his wits. "Eh?" he squawked.

I hastened to explain: "That pipeline's so tiny and so deep that I'll have to work from directly above it. That means hauling my gear right up to the window and dumping it all over the copilot's chair. You're bound to get clonked. Sorry."

Craig gestured Ricci out of his seat behind the navigator's table. "Up, lad. Help him."

Together Ricci and I manhandled to the window those items I needed. We wedged them between my chair and the controlboard. Craig suffered the occasional thump without complaint. There was desperately little space. Cables trailed everywhere. It was a miracle that Ricci and I didn't trip and smash the lot.

Pinned among my gear at the window, I settled down as best I could, hunching my body in a vain effort to escape the brilliance blasting up from the ground. I made sure that the recorders were functioning unjarred by their rough handling, and wondered. How deep would this vent prove to be? What

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was its etiology? The seam which had spawned it overlay a mascon. What was the mascon's composition? Was it a brutally compressed intrusion of magma, like the first, or of—what? I had no idea.

Did the vent—could any vent!—pierce deeply enough to tap the mascon? If it did, why had the savagely crushed material not jetted upward, stoppering its safety valve with congealing melt? My instruments showed the mascon to be extremely hot and dense, and (judging distance by planetary scale) relatively near the surface. Yet the area was quiescent—so my readings showed. It didn't make sense. That mascon ought to be a seething inferno, dragged into renewed activity by the gravitational pull of the perihelion sun.

Why was the vent so straight?

A prickle of unease ran up my spine.

The crust at Mercury's hot spot was in constant, albeit sluggish, motion, powered by the nuclear horror ravening overhead. Plastic flow should have warped that pipeline out of true. It had not, which could mean only one thing: the vent was very recent indeed. Its lifespan was measurable in hours—or minutes.

I thought of the other mascon, of the other rift whose violent bursting had almost scooped us out of the sky. I twisted to check the strain gauge. Its needles were vibrating rapidly, but held within the limits for safety.

I stood locked in indecision. I felt a nerve jumping in my cheek.

Craig's glance fastened on my face, as penetrating as a laser. "What's wrong, Doctor?" he demanded.

I made a helpless gesture. "Nothing. According to my instruments this area is stable. But . . ." I fumbled for words which would not brand me as a crackpot, shying at fancies. "I'm not happy. Let's move."

Craig said dryly, "For once we're in agreement!" He pulled levers. Nothing happened. He tried them again, this time very gently. Still nothing. He pressed a button and, holding it down, gave the master lever a sharp hard jerk. The daysider remained poised above the vent. Poised? Almost imperceptibly it was beginning to settle. Its shadow grew. The vent, dead center, aimed straight at us like a weapon.

Craig reached for the intercom. Before his fingers touched it, it squealed. He flicked a switch, leaned toward the mouthpiece. "Why aren't the controls responding, Anderson?"

The engineer's voice answered tersely: "Sir, we're in trouble. The refrigeration unit has broken down completely. A section of the fuel system has jammed with the heat."

"Can you rig a bypass?" asked Craig.

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Silence, punctured by faint clanks and rattles. Then: "Probably. It may not work."

"How soon can you rig it?"

"An hour."

Craig looked at me. "Have we got an hour?"

I lifted my shoulders. "God knows."

"Just how dangerous is that vent?"

My glance traveled to the strain gauge, to the pressure gauge. No danger at all . . . which merely heightened my inexplicable anxiety. I repeated, "God knows."

Craig spoke into the intercom. "Hear that, Anderson?"

"Yes." The alarm in the engineer's voice came through clearly.

"Do you need help?" Craig inquired.

"No thanks. Explaining things to a helper would slow me down. I can work faster alone."

"As you wish. Rig that bypass as soon as possible. But first, stop us sinking or we'll end up stuck on that hole like a cap on a bottle. Can you do it?"

"I'll try."

Craig broke the connection.

I checked my apparatus, seeking malfunctions. If the heat had knocked out the daysider's fuel system, it could have affected my instruments as well, despite their independent power source. But no, all was normal, as far as I could tell.

My intuition continued to warn insistently of danger. *Why?*

I whipped around, snatched the printouts from the recorders. I raced down columns of data. Fright chilled me, for they told me nothing—yet I *knew* that, slowly but inexorably, pressure must be building in the unguessable dense layer at the bottom of the pipe.

Another thing I knew: this wasn't the only vent piercing the seam. It couldn't be. There had to be others, numerous others, some not yet fully formed, some stoppered tight. In turn they would relieve the unendurable pressure underground. Yet not one was active at this moment. Why not?

This was absurd. Here was I, a trained geologist, making the Error of Errors: relying on a hunch instead of on my equipment. Those gauges were far less fallible than a man's weak eyes and subjective brain. If they showed this zone to be stable, then stable it was.

I tried to relax. Instead, I started sweating profusely.

Craig divided his attention between me and the vent. Ricci gnawed his fingernails. We waited for the intercom to crackle, for Anderson to tell us we could leave.

The intercom stayed silent.

God, how I wished that I had heeded Craig's advice! But no: still bristling at his lecture about risk-taking, I had goaded him into stationing us here against his better judgment. That fit of childish pique

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of mine might well have doomed us all.

The heat, and our tension, climbed and climbed.

I tried to track my hunch to its source by reviewing my observations. From them had emerged the following theory: that hot spot vulcanism resulted from the colossal stresses set up in Mercury's crust by the drag of the sun. Excessive heating of the subsolar surface aided the formation of the volcanoes. My geologist's instinct clamored that I was right—which meant that tectonic activity in this region was governed by well-attested, long-proven laws. In turn this meant that I could trust my instruments. Indeed, I must, or all research was useless.

But Mercury was an alien planet, subject to alien laws. How dared I trust instruments designed on Earth? Anything could happen here: anything at all.

I turned to the window again. Our downward drift had stopped. We hung a few short yards above the vent, directly in its line of fire. All around, Mercury spread its flayed hide to the devouring sun. The vent was a worm-hole eating down to the bone. I peered into it, striving desperately to wrest the secret from that opalescent darkness. Something monstrous *must* be happening in that unimaginable nether world. We *had* to escape.

We could not escape.

Realization broke through the barrier of exhaustion which dulled my mind: I understood our peril. My intuition sprang from an elementary physical fact which I should have remembered long ago. Funnel a broad, slow-flowing river into a narrow canyon, and it becomes a raging torrent. Similarly, in the mascon vast pressure stood within the safety limits because it was distributed throughout a vast area; but let that pressure force open a single narrow vent, and the gas-impregnated melt would explode.

I thought of warning Craig, but desisted. No practical purpose would be served thereby. I watched dials and meters, alert for the tiniest change. I watched the quiet vent.

I grew hideously frightened.

A pinpoint of luminescence seemed to glimmer faintly in the lowest depths of the pipe. I blinked, and it was gone. I strained and strained to glimpse it again . . . and there it was: fractionally brighter, fractionally larger—fractionally nearer. It was lunging upward like a bullet in a gun-barrel.

My nerve broke. "Get us away!" I yelled. My voice cracked into falsetto.

The daysider screamed forward, rising steeply; Craig had not waited to consult Anderson before engaging drive. Where was the point? We died ruptured by an engine-room explosion or impaled on a spear of flame: it made no difference.

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We lived. We rocketed away from the danger zone, then slowed, then turned toward the now far distant place where the vent drilled down to the mascon.

"Holy Mother of God!" That was Ricci, hoarse with horror and awe.

Craig drew a deep breath, let it hiss out softly between his teeth.

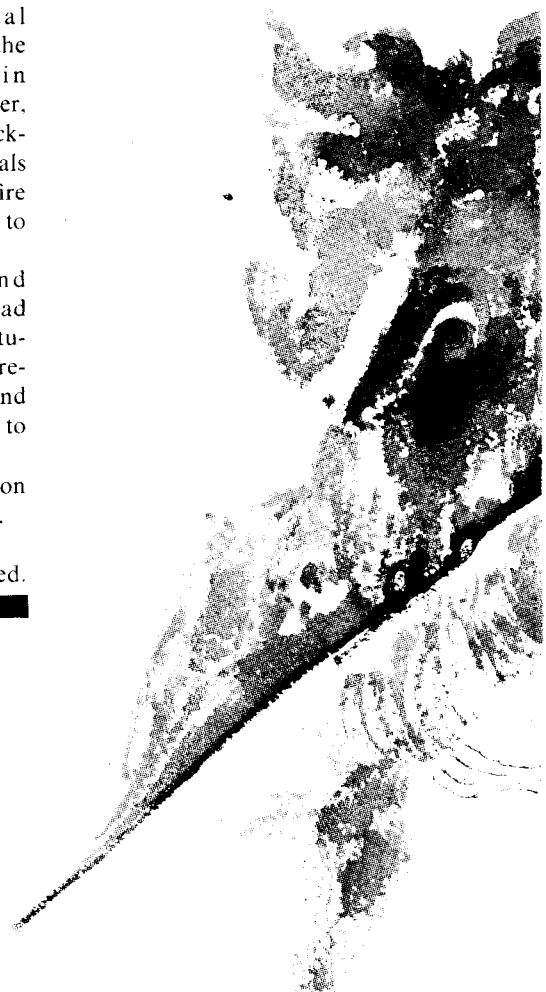
A fountain of liquid metal punched five thousand feet into the sky. The top of the fountain splayed out like a blazing flower, white and gold against the backdrop of black vacuum. The petals curled, splitting into shafts of fire which plummeted unhindered to the smoking ground.

I reached for cameras and spectrosope. That jet of metal had to be captured on film, its constituents analyzed, its temperature recorded. I stooped to my task—and froze. Reaction hit me. I began to tremble violently.

Craig tried to raise Anderson on the intercom. There was no reply.

"I'll go," said Ricci.

Some minutes later he returned.



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"Anderson's collapsed, sir. The engine room's like a blast furnace, worse even than here. I've dragged him into the passage and chucked a bucket of water over him."

"Has he rigged a reliable fuel bypass?" Craig asked urgently.

"He's rigged something, heaven knows what. I burned my arm on it." Ricci indicated a charred patch on his sleeve.

"We'll risk a dash for the nightside," said Craig. He swung the daysider around, flogged it to its greatest possible speed. He looked near collapse himself. His bronzed face gleamed sickly pale under a varnish of perspiration.

Ricci sat down, reached for his charts. Quick and neat, he plotted our flight path. He offered few comments, few course corrections. So long as he kept track of our position, nightsiders could be summoned to our rescue—provided that we reached the nightside. *Where* we reached it mattered little. Top priority was to escape the murderous sun.

We were traveling too fast for my equipment to function effectively, although my faith in it was restored. The facts it had revealed had been correct; I had failed to make the necessary deductions.

I shut down my apparatus, item by item; stowed it as neatly as I could against the wall. Thereafter my hands and my mind were empty. My imagination, free-wheeling, conjured the half-melted wreck of our sister craft. Its crew's fate still could be ours. We still might learn the full meaning of agony, still might smell our own flesh roasting as we died.

The daysider's motion grew erratic. Every so often it gave a tiny but sickening lurch. Certain engine components were beginning to run red-hot; soon they would seize up altogether.

I waited, rigid with suppressed panic. I was wretchedly aware of my body: of aching muscles, of labored breathing and pounding pulse, of sweat-drenched clothing clinging to my skin.

The hot spot fell away behind us. The terrain changed. We hurtled past crumbling crags and sword-edged pinnacles. Dully glowing shadows, stubby at first but lengthening, thrust toward a horizon which etched a line of jagged brightness on the sky.

My head throbbed excruciatingly. I curled into a ball with my hands covering my tortured eyes and my fingers digging into my hair. I had gazed too long upon the inhuman glory of the dayside. The price was pain: pain which the heat was aggravating beyond endurance.

Craig spoke. I don't know what he said; I wasn't listening; but the subject must have been me, for seconds later Ricci was at my side. From light-years away I heard his voice: "Come."

"Where?" I mumbled.

"Washroom."

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Movement was impossible; pain paralyzed my will. I felt Ricci's slim strong fingers clamp around my wrists. I let him pull me from my chair, guide me across the cabin. I walked as gently as I could. If I jarred my splitting skull, it would burst into fragments.

One thing was clear: my work on Mercury was likely to remain unfinished. It had been intended that tomorrow, Earth-time, I should visit the hot spot lying at this moment frigid and inactive at the center of the nightside. My instructions were to locate its probable deposits of uranium ore. Even if I lived, the damage to my eyes would make me useless for a long while.

In the passage we almost stepped on Anderson. He was sprawled half lying, half leaning against the wall. He blinked at us blearily, but made no attempt to move out of our way.

Outside the washroom Ricci said, "Wait." I waited obediently. Tablets and a mug of water were thrust into my hands. "Get those inside you," Ricci ordered.

"What are they?"

"Pain-killers. Three."

I swallowed them. Relief came within minutes.

Ricci ran tepid water into the basin. "Dunk your head in that."

I dunked. The water was bliss. I stayed down until my starved lungs forced me to come spluttering up for air. Ricci passed me a towel. I used it, very gently, for it rasped

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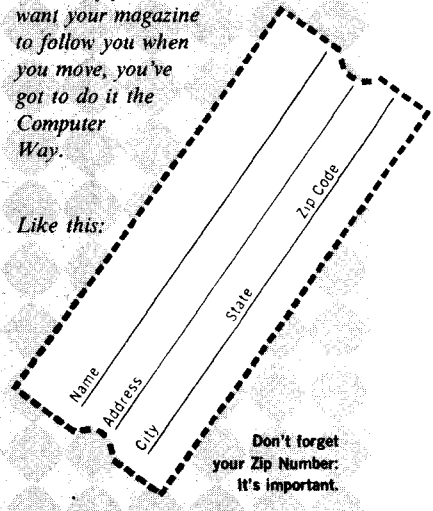

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like sandpaper. With difficulty I focused my light-scourged eyes on the mirror.

"Christ Almighty!" Shock jolted the oath out of me before I could catch my tongue.

Ricci reverted to his old provocative self. One of his eyebrows lifted wickedly. "Nice, isn't it? Think of the magnificent tan you'll have when that little lot dies down!"

That little lot was the king of all glare-burns. My face looked like raw red steak and felt as tight as a drum. It would blister splendidly tomorrow—if I had a tomorrow.

"Back at the Base we've a wonder-cream that will fix it in no time," Ricci told me cheerfully. "But *mama mia,* how you'll peel!"

I must have looked curious, for he laughed delightedly. "My God, Doc, you should have been an actor! You have the most expressive face I've ever seen!"

I refused the bait—which proved to be a mistake, since Ricci was hell-bent on making me explode. "It's a good job that looks can't kill," said he, "or I'd be dead at your feet by now." He grinned, his sardonic black eyes alight with mockery. "You're ideally suited to your work. Guess why!"

"Tell me," I said grimly. Nothing short of dynamite would stop him with a punch line begging to be delivered.

"You're a volcano yourself. Miniature, of course, but capable of spectacular eruptions. See! You're boiling up to one right now!"

Abruptly I made for the passage. Ricci caught up with me, walked in silence at my side. Suddenly he said: "Odd how it affects one, isn't it? A brush with death, I mean. Particularly when every passing second increases its ghastliness."

I stood still, one foot poised for a step which was never taken. "Oh? Why?"

Ricci halted but kept his face averted. "Use your brain, Doc. The closer we get to the nightside, the cooler grows the ground, so, if we're forced down, the longer we'll take to die." His fingers linked into a knot which twisted tighter and tighter. "Know something? I've got a bad attack of the shakes. The absurd thing is, I seem to steady down more easily if someone else lets fly." His glance touched mine and darted away. "That's why I tried to provoke you. I—I wish I knew how to apologize."

On impulse I put my fist between Ricci's shoulder blades. Gruffly I said, "You're not the only one with the shakes." With rough gentleness I pushed him to the control cabin, prodded him toward his chair.

Lurching, juddering, the daysider streaked for the nightside. Our air grew acrid with the stink of smoldering insulation. Here was a new hazard: fire. Could the extinguishers cope, or would we suffocate in smoke . . . or burn alive?

Craig had smelled it too. His

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nostrils twitched. Terror brushed his face, to vanish at once behind a wall of unconcern. His slitted eyes scanned the control board. Without haste he pulled a knob. It must have connected with the ventilation system, for the acrid stench increased and fumes scraped my throat. I coughed.

Craig tapped the knob home again; reached for a small, bright red switch; threw it. A lever slipped its cogs and sprang up, jumping and rattling. Craig forced it down, held it in position by sheer brute strength. A light began to wink on the control board—a warning light which he ignored.

Ricci caught his breath. I looked around quickly. Our navigator's face was vivid with alarm.

"What have you done?" I asked Craig.

"Overridden the safety locks to give us more speed."

"That sounds bad."

"It is. Very." Craig glanced at the winking light. "As you can see, the engines hate it. They may well blow up. If so, I've killed us all."

The words should have been melodramatic. They were not; they were as cool as pebbles dredged from a lake in midwinter. Trying to match this coolness, I said: "So you're gambling, are you—gambling that you can get us to the nightside before we're ripped apart?"

"Yes."

I managed to smile. "Isn't that . . . a hair-raising risk?"

Craig kept his gaze fixed on the terrain ahead, but I saw him stiffen in startled understanding. "It is," he agreed. He added with a flash of wry humor, "I take your point."

Ricci butted in: "What point, sir?" To Ricci, who knew nothing of Craig's little lecture to me about risk-taking, our byplay was incomprehensible.

"Many jobs entail risks of one kind or another," Craig told him, and finished ruefully, "Eh, Dr. Collins?"

I gave a noncommittal grunt, aware that Craig's motives for risk-taking were different from mine.

The Analytical Laboratory/January 1974

PLACE	TITLE	AUTHOR	POINTS
1.	The Sins of the Fathers (Conc.)	*Stanley Schmidt*	1.77
2.	The Horus Errand	*William E. Cochrane*	2.50
3.	The Hole Man	*Larry Niven*	2.76
4.	The Astounding Dr. Amizov	*R.F. DeBaun*	3.11

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Craig was acting from necessity, to save our lives. My motives were less worthy: I loved my work, but also the acclaim which sometimes followed. I was obsessed by curiosity to the point where human values took second place—except on the occasion when I had goaded Craig into positioning us above the vent: injured pride had precipitated that. I felt thoroughly ashamed of myself.

Craig must have sensed my discomfort. He flicked me a glance—friendly, mischievous, accompanied by a quick crooked grin: the last kind of glance I expected. He looked away before I could respond. I was thankful; at this very moment I was busy realizing that I had come to like and respect him more than I would have imagined possible. It was an odd sensation; I needed time to come to terms with it.

Ricci eyed us, his puzzlement increasing until he was one huge, obtrusive, silent question mark . . . the crucial word being *silent*. I hoped to God that he would remain so; in the charged atmosphere which now prevailed, overt comment would be exquisitely embarrassing.

Ricci kept his mouth shut. Reluctantly he bent his attention to his navigation gear. The threat of a public soul-baring display was averted.

Slowly I relaxed. I concentrated on the scene tumbling past our window. Far ahead of us raced our shadow, an ever-changing blob which danced and bounded over the ravaged rockscape. I watched it, breathing shallowly, trying not to notice our vile air. Choke just once, and I would go on choking till I died.

"Two degrees to port, sir," husked Ricci.

"Two degrees to port," Craig repeated. He altered our course.

Behind us, bloated and ferocious, sank the sun. Our shadow fled further and further away. Came the blessed instant when it vanished permanently upward into the star-spiked darkness of the sky.

Ricci buried his head in his hands; then lowered them, busied himself with his charts. He assumed a calm and casual pose which was ruined through being grossly overplayed.

Craig slowed the daysider to a safer speed. The winking light went out. The juddering diminished. Craig tested the controls.

I croaked, "Will we survive?"

Craig studied me briefly. I avoided his gaze, too avid for reassurance to trust myself to meet those bright, tired eyes. "Probably," he answered. His voice held no emotion at all.

With unsteady fingers I rubbed my forehead, pushing back my soaked and tangled hair. The nightmare was finished: we would live: probably. I began at last to dare to contemplate the future. ■

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JACK GAUGHAN

Instant transportation will change society in many ways—but will it change people?

A Kind of Murder

LARRY NIVEN

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"You are constantly coming to my home!" he shouted. "You never think of calling first. Whatever I'm doing, suddenly you're there. And where the hell do you keep getting keys to my door?"

Alicia didn't answer. Her face, which in recent years had taken on a faint resemblance to a bulldog's, was set in infinite patience as she relaxed at the other end of the couch. She had been through this before, and she waited for Jeff to get it over with.

He saw this, and the dinner he had not quite finished settled like lead in his belly. "There's not a club I belong to that you aren't a member too. Whoever I'm with, you finagle me into introducing you. If it's a man, you try to make him, and if he isn't having any you get nasty. If it's a woman, there you are like the ghost at the feast. The discarded woman. It's a drag," he said. He wanted a more powerful word, but he couldn't think of one that wouldn't sound overdramatic, silly.

She said, "We've been divorced six years. What do you care who I sleep with?"

"I don't like looking like your pimp!"

She laughed.

The acid was rising in his throat. "Listen," he said, "why don't you give up one of the clubs? W-we belong to *four.* Give one up. Any of them." *Give me a place of refuge,* he prayed.

"They're my clubs too," she said with composure. "*You* change clubs."

He'd joined the Lucifer Club four years ago, for just that reason. She'd joined too. And now the words clogged in his throat, so that he gaped like a fish.

There were no words left. He hit her.

He'd never done that before. It was a full-arm swing, but awkward because they were trying to face each other on the couch. She rode with the slap, then sat facing him, waiting.

It was as if he could read her mind. *We've been through this before, and it never changes anything. But it's your tantrum.* He remembered later that she'd said that to him once, those same words, and she'd looked just like that: patient, implacable.

The call reached Homicide at 8:36 PM, July 20, 2019. The caller was a round-faced man with straight black hair and a stutter. "My ex-wife," he told the desk man. "She's dead. I just got home and f-found her like this. S-someone seems to have hit her with a c-cigarette box."

Hennessey (Officer-Two) had just come on for the night shift. He took over. "You just got home? You called immediately?"

"That's right. C-c-could you come right away?"

"We'll be there in ten seconds.

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Have you touched anything?"

"No. Not her, and not the box."

"Have you called the hospital?"

His voice rose. "No. She's *dead.*"

Hennessey took down his name—Walters—and booth number and hung up. "Linc, Fisher, come with me. Torrie, will you call the City Hospital and have them send a copter?" If Walters hadn't touched her he could hardly be sure she was dead.

They went through the displacement booth one at a time, dialing and vanishing. For Hennessey it was as if the Homicide Room vanished as he dialed the last digit, and he was looking into a porch light.

Jeffrey Walters was waiting in the house. He was medium-sized, a bit overweight, his light brown hair going thin on top. His paper business suit was wrinkled. He wore an anxious, fearful look—which figured, either way, Hennessey thought.

And he'd been right. Alicia Walters was dead. From her attitude she had been sitting sideways on the couch when something crashed into her head, and she had sprawled forward. A green cigarette box was sitting on the glass coffee table. It was bloody along one edge, and the blood had marked the glass.

The small, bloody, beautifully-marked green malachite box could have done it. It would have been held in the right hand, swung full-armed. One of the detectives used chalk to mark its position on the table, then nudged it into a plastic bag and tied the neck.

Walters had sagged into a reading chair as if worn out. Hennessey approached him. "You said she was your ex-wife?"

"That's right. She didn't give up using her married name."

"What was she doing here, then?"

"I don't know. We had a fight earlier this evening. I finally threw her out and went back to the Sirius Club. I was half afraid she'd just follow me back, but she didn't. I guess she let herself back in and waited for me here."

"She had a key?"

Walters' laugh was feeble. "She always had a key. I've had the lock changed twice. It didn't work. I'd come home and find her here. 'I just wanted to talk,' she'd say." He stopped abruptly.

"That doesn't explain why she'd let someone else in."

"No. She must have, though, mustn't she? I don't know why she did that."

The ambulance helicopter landed in the street outside. Two men entered with a stretcher. They shifted Alicia Walters' dead body to the stretcher, leaving a chalk outline Fisher had drawn earlier.

Walters watched through the picture window as they walked the stretcher into the portable Jump-Shift unit in the side of the copter.

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They closed the hatch, tapped buttons in a learned rhythm on a phone dial set in the hatch. When they opened the hatch to check, it was empty. They closed it again and boarded the copter.

Walters said, "You'll do an autopsy immediately, won't you?"

"Of course. Why do you ask?"

"Well . . . it's possible I might have an alibi for the time of the murder."

Hennessey laughed before he could stop himself. Walters looked puzzled and affronted.

Hennessey didn't explain. But later—as he was leaving the station house for home and bed—he snorted. "Alibi," he said. "Idiot."

The displacement booths had come suddenly. One year, a science-fiction writer's daydream. The next year, 1922, an experimental reality. Teleportation. Instantaneous travel. Another year and they were being used for cargo transport. Two more, and the passenger displacement booths were springing up everywhere in the world.

By luck and the laws of physics, the world had had time to adjust. Teleportation obeyed the Laws of Conservation of Energy and Conservation of Momentum. Teleporting uphill took an energy input to match the gain in potential energy. A cargo would lose potential energy going downhill—and it was over a decade before JumpShift Inc. learned how to compensate for that effect. Teleportation over great distances was even more heavily restricted by the Earth's rotation.

Let a passenger flick too far west, and the difference between his momentum and the Earth's would smack him down against the floor of the booth. Too far east, and he would be flung against the ceiling. Too far north or south, and the Earth would be rotating faster or slower; he would flick in moving sideways, unless he had crossed the equator.

But cargo and passengers could be displaced between points of equal longitude and opposite latitude. Smuggling had become impossible to stop. There was a point in the South Pacific to correspond to any point in the United States, most of Canada, and parts of Mexico.

Smuggling via the displacement booths was a new crime. The Permanent Floating Riot Gangs were another. The booths would allow a crowd to gather with amazing rapidity. Practically any news broadcast could start a flash crowd. And with the crowds the pickpockets and looters came flicking in.

When the booths were new, many householders had taken to putting their booths in the living rooms or entrance halls. That had stopped fast, after an astounding rash of burglaries. These days only police stations and hospitals kept their booths indoors.

For twenty years the booths had

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not been feasible over distances greater than ten miles. If the short-distance booths had changed the nature of crime, what of the long-distance booths? They had been in existence only four years. Most were at what had been airports, being run by what had been airline companies. Dial three numbers and you could be anywhere on Earth.

Flash crowds were bigger and more frequent.

The alibi was as dead as the automobile.

Smuggling was cheaper. The expensive, illegal transmission booths in the South Pacific were no longer needed. Cutthroat competition had dropped the price of smack to something the Mafia wouldn't touch.

And murder was easier; but that was only part of the problem. There was a new *kind* of murder going around.

Hank Lovejoy was a tall, lanky man with a lantern jaw and a ready smile. The police had found him at his office–real estate–and he had agreed to come immediately.

"There were four of us at the Sirius Club before Alicia showed up," he said. "Me, and George Larimer, and Jeff Walters, and Jennifer–wait a minute–Lewis. Jennifer was over at the bar, and we'd, like, asked her to join us for dinner. You know how it is in a continuity club: you can talk to anyone. We'd have picked up another girl sooner or later."

Hennessey said, "Not two?"

"Oh, George is a monogamist. His wife is eight months pregnant, and she didn't want to come, but George just doesn't. He's not fay or anything, he just doesn't. But Jeff and I were both sort of trying to get Jennifer's attention. She was loose, and it looked likely she'd go home with one or the other of us. Then Alicia came in."

"What time was that?"

"Oh, about six-fifteen. We were already eating. She came up to the table, and we all kind of waited for Jeff to introduce her and ask her to sit down, she being his ex-wife, after all." Lovejoy laughed. "George doesn't really understand about Jeff and Alicia. Me, I thought it was funny."

"What do you mean?"

"Well, they've been divorced about six years, but it seems he just can't get away from her. Couldn't, I mean," he said, remembering. Remembering that good old Jeff *had* gotten away from her, because someone had smashed her skull.

Hennessey was afraid Lovejoy would clam up. He played stupid. "I don't get it. A divorce is a divorce, isn't it?"

"Not when it's a quote friendly divorce unquote. Jeff's a damn fool. I don't think he gave up sleeping with her, not right after the divorce. He wouldn't live with her, but every so often she'd, well,

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she'd seduce him, I guess you'd say. He wasn't used to being alone, and I guess he got lonely. Eventually he must have given that up, but he still couldn't get her out of his hair.

"See, they belonged to all the same clubs and they knew all the same people, and as a matter of fact they were both in routing and distribution software; that was how they met. So if she came on the scene while he was trying to do something else, there she was, and he had to introduce her. She probably knew the people he was dealing with, if it was business. A lot of business gets done at the continuity clubs. And she wouldn't go away. I thought it was funny. It worked out fine for me, last night."

"How?"

"Well, after twenty minutes or so it got through to us that Alicia wasn't going to go away. I mean, we were eating dinner, and she wasn't, but she wanted to talk. When she said something about waiting and joining us for dessert, Jeff stood up and suggested they go somewhere and talk. She didn't look too pleased, but she went."

"What do you suppose he wanted to talk about?"

Lovejoy laughed. "Do I read minds without permission? He wanted to tell her to bug off, of course! But he was gone half an hour, and by the time he came back Jennifer and I had sort of reached a decision. And George had this benign look he gets, like, *Bless you my children.* He doesn't play around himself, but maybe he likes to think about other couples getting together. Maybe he's right; maybe it brightens up the marriage bed."

"Jeff came back alone?"

"That he did. He was nervous, jumpy. Friendly enough; I mean, he didn't get obnoxious when he saw how it was with me and Jennifer. But he was sweating, and I don't blame him."

"What time was this?"

"Seven-twenty."

"Dead on?"

"Yeah."

"Why would you remember a thing like that?"

"Well, when Jeff came back he wanted to know how long he'd been gone. So I looked at my watch. Anyway, we stayed another fifteen minutes and then Jennifer and I took off."

Hennessey asked, "Just how bad were things between Jeff and Alicia?"

"Oh, they didn't *fight* or anything. It was just—funny. For one thing, she's kind of let herself go since the divorce. She used to be pretty. Now she's gone to seed. Not many men chase her these days, so she has to do the chasing. Some men like that."

"Do you?"

"Not particularly. I've spent some nights with her, if that's what you're asking. I just like variety.

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I'm not a heartbreaker, man; I run with girls who like variety too."

"Did Alicia?"

"I think so. The trouble was, she slept with a lot of guys Jeff introduced her to. He didn't like that. It made him look bad. And once she played nasty to a guy who turned her down, and it ruined a business deal."

"But they didn't fight."

"No. Jeff wasn't the type. Maybe that's why they got divorced. She was just someone he couldn't avoid. We all know people like that."

"After he came back without Alicia, did he leave the table at any time?"

"I don't think so. No. He just sat there, making small talk. Badly."

George Larimer was a writer of articles, one of the few who made good money at it. He lived in Arizona. No, he didn't mind a quick trip to the police station, he said, emphasizing the *quick.* Just let him finish this paragraph . . . and he breezed in five minutes later.

"Sorry about that. I just couldn't get the damn wording right. This one's for *Viewer's Digest,* and I have to explain drop ship technology for morons without talking down to them or the minimal viewer won't buy it. What's the problem?"

Hennessey told him.

His face took on an expression Hennessey recognized: like he ought to be feeling something, and he was trying, honest. "I just met her that night," he said. "Dead. Well."

He remembered that evening well enough. "Sure, Jeff Walters came back about the time we were finishing coffee. We had brandy with the coffee, and then Hank and, uh, Jennifer left. Jeff and I sat and played dominoes over Scotch and sodas. You can do that at the Sirius, you know. They keep game boxes there, and they'll move up side tables at your elbows so you can have drinks or lunch."

"How did you do?"

"I beat him. Something was bothering him; he wasn't playing very well. I thought he wanted to talk, but he wouldn't talk about whatever was bugging him."

"His ex-wife?"

"Maybe. Maybe not. I'd only just met her, and she seemed nice enough. And she seemed to like Jeff."

"Yeah. Now, Jeff left with Alicia. How long were they gone?"

"Half an hour, I guess. And he came back without her."

"What time?"

"Quarter past seven or thereabouts. Ask Hank. I don't wear a watch." He said this with a certain pride. A writer doesn't need a watch; he sets his own hours. "As I said, we had dessert and coffee and then played dominoes for an hour, maybe a little less. Then I had to go home to see how my wife was

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getting along in my absence."

"While you were having dessert and coffee and playing dominoes, did Jeff Walters leave the table at any time?"

"Well, we switched tables to set up the game." Larimer shut his eyes to think. He opened them. "No, he didn't go to the bathroom or anything."

"Did you?"

"No. We were together the whole time, if that's what you want to know."

Hennessey went out for lunch after Larimer left. Returning, he stepped out of the Homicide Room booth just ahead of Officer-One Fisher, who had spent the morning at Alicia Walters' place.

Alicia had lived in the mountains, within shouting distance of Lake Arrowhead. Property in that area was far cheaper than property around the lake itself. The high rent district in the mountains is near streams and lakes. Her own water supply had come from a storage tank kept filled by a small JumpShift unit.

Fisher was hot and sweaty and breathing hard, as if he had been working. He dropped into a chair and wiped his forehead and neck. "There wasn't much point in going," he said. "We found what was left of a bacon and tomato sandwich sitting on a place mat. Probably her last meal. She wasn't much of a housekeeper. Probably wasn't making much money, either."

"How so?"

"All her gadgetry is old enough to be going to pieces. Her Dustmaster skips corners and knocks things off tables. Her chairs and couches are all blow-ups, inflated plastic. Cheap, but they have to be replaced every so often, and she didn't. Her displacement booth must be ten years old. She should have replaced it, living in the mountains."

"No roads in that area?"

"Not near her house, anyway. In remote areas like that they move the booths in by helicopter, then bring the components for the house out through the booth. If her booth broke down she'd have had to hike out, unless she could find a neighbor at home, and her neighbors aren't close. I like that area," Fisher said suddenly. "There's elbow room."

"She should have made good money. She was in routing and distribution software." Hennessey pondered. "Maybe she spent all her time following her ex-husband around."

The autopsy report was waiting on his desk. He read through it.

Alicia Walters had indeed been killed by a single blow to the side of the head, almost certainly by the malachite box. Its hard corner had crushed her skull around the temple. Malachite is a semiprecious stone, hard enough that no part of

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it had broken off in the wound; but there was blood, and traces of bone and brain tissue, on the box itself.

There was also a bruise on her cheek. *Have to ask Walters about that,* he thought.

She had died about 8:00 PM, given the state of her body, including body temperature. Stomach contents indicated that she had eaten about 5:30 PM: a bacon and tomato sandwich.

Hennessey shook his head. "I was right. He's still thinking in terms of alibis."

Fisher heard. "Walters?"

"Sure, Walters. Look: he came back to the Sirius Club at 7:20, and he called attention to the time. He stayed until around 8:30, to hear Larimer tell it, and he was always in someone's company. Then he went home, found the body and called us. The woman was killed around eight, which is right in the middle of his alibi time. Give or take fifteen minutes for the lab's margin of error, and it's still an alibi."

"Then it clears him."

Hennessey laughed. "Suppose he did go to the bathroom. Do you think anyone would remember it? Nobody in the world has had an alibi for anything since the JumpShift booths took over. You can be at a party in New York and kill a man in the California Sierras in the time it would take to go out for cigarettes. You can't use displacement booths for an alibi."

"You could be jumping to conclusions," Fisher pointed out. "So he's not a cop. So he reads detective stories. So someone murdered his wife in his own living room. *Naturally* he wants to know if he's got an alibi."

Hennessey shook his head.

"She didn't bleed a lot," said Fisher. "Maybe enough, maybe not. Maybe she was moved."

"I noticed that too."

"Someone who knew she had a key to Walters' house killed her and dumped her there. He would have hit her with the cigarette box in the spot where he'd already hit her with something else."

Hennessey shook his head again. "It's not just Walters. It's a *kind* of murder. We get more and more of these lately. People kill each other because they can't move away from each other. With the long distance booths everyone in the country lives next door to everyone else. You live a block away from your ex-wife, your mother-in-law, the girl you're trying to drop, the guy who lost money in your business deal and blames you. Any secretary lives next door to her boss, and if he needs something done in a hurry she's right there. God help the doctor if his patients get his home number. I'm not just pulling these out of the air. I can name you an assault rap for every one of these situations."

"Most people get used to it,"

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said Fisher. "My mother used to flick in to visit me at work, remember?"

Hennessey grinned. He did. Fortunately she'd given it up. "It was worse for Walters," he said.

"It didn't really sound that bad. Lovejoy said it was a friendly divorce. So he was always running into her. So what?"

"She took away his clubs."

Fisher snorted. But Fisher was young. He had grown up with the short-distance booths.

For twenty years passenger teleportation had been restricted to short hops. People had had time to get used to the booths. And in those twenty years the continuity clubs had come into existence.

The continuity club was a guard against future shock. Its location . . . ubiquitous: hundreds of buildings in hundreds of cities, each building just like all the others, inside and out. Wherever a member moved in this traveling society, the club would be there. Today even some of the customers would be the same: everyone used the long-distance booths to some extent.

A man had to have some kind of stability in his life. His church, his marriage, his home, his club. Any man might need more or less stability than the next. Walters had belonged to *four* clubs . . . and they were no use to him if he kept meeting Alicia there. And his marriage had broken up, and he wasn't a churchgoer, and a key to his house had been found in Alicia's purse. She should at least have left him his clubs.

Fisher spoke, interrupting his train of thought. "You've been talking about impulse murders, haven't you? Six years of not being able to stand his ex-wife and not being able to get away from her. So finally he hits her with a cigarette box."

"Most of them are impulse murders, yes."

"Well, this wasn't any impulse murder. Look at what he had to do to bring it about. He'd have had to ask her to wait at home for him. Then make some excuse to get away from Larimer, shift home, kill her *fast* and get back to the Sirius Club before Larimer wonders where he's gone. Then he's got to hope Larimer will forget the whole thing. That's not just cold-blooded, it's also stupid."

"Yeah. So far it's worked, though."

"Worked, hell. The only evidence you've got against Walters is that he had good reason to kill her. Listen, if she got on his nerves that much, she may have irritated some other people too."

Hennessey nodded. "That's the problem, all right." But he didn't mean it the way Fisher did.

Walters had moved to a hotel until such time as the police were through with his house. Hennessey called him before going off duty.

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"You can go home," he told him.

"That's good," said Walters. "Find out anything?"

"Only that your wife was murdered with that selfsame cigarette box. We found no sign of anyone in the house except her, and you." He paused, but Walters only nodded thoughtfully. He asked, "Did the box look familiar to you?"

"Oh, yes, of course. It's mine. Alicia and I bought it on our honeymoon, in Switzerland. We divided things during the divorce, and that went to me."

"All right. Now, just how violent was that argument you had?"

He flushed. "As usual. I did a lot of shouting, and she just sat there letting it go past her ears. It never did any good."

"Did you strike her?"

The flush deepened, and he nodded. "I've never done that before."

"Did you by any chance hit her with a malachite box?"

"Do I need a lawyer?"

"You're not under arrest, Mr. Walters. But if you feel you need a lawyer, by all means get one." Hennessey hung up.

He had asked to be put on the day shift today, in order to follow up this case. It was quitting time now, but he was reluctant to leave.

Officer-One Fisher had been eavesdropping. He said, "So?"

"He never mentioned the word *alibi*," said Hennessey. "Smart. He's not supposed to know when she was killed."

"You're still sure he did it."

"Yeah. But getting a conviction is something else again. We'll find more people with more motives. And all we've got is the laboratory." He ticked items off on his fingers. "No fingerprints on the box. No blood on Walters or any of his clothes, unless he had paper clothes and ditched 'em. No way of proving Walters let her in or gave her the key . . . though I wonder if he really had that much trouble keeping her out of the house.

"We'd be asking a jury to believe that Walters left the table and Larimer forgot about it. Larimer says no. Walters is pretty sure to get the benefit of the doubt. She didn't bleed much; a good defense lawyer is bound to suggest that she was moved from somewhere else."

"It's possible."

"She wasn't dead until she was hit. Nothing in the stomach but food. No drugs or poisons in the bloodstream. She'd have had to be killed by someone who"—he ticked them off—"knew she had Walters' key; knew Walters' displacement booth number; and knew Walters wouldn't be home. Agreed?"

"Maybe. How about Larimer or Lovejoy?"

Hennessey spread his hands in surrender. "It's worth asking. Larimer's alibi is as good as Walters', for all that's worth. And we've still got to interview Jennifer Lewis."

"Then again, a lot of people at the Sirius Club knew Walters.

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Some of them must have been involved with Alicia. Anyone who saw Walters halfway through a domino game would know he'd be stuck there for a while."

"True. Too true." Hennessey stood up. "Guess I'll be getting dinner."

Hennessey came out of the restaurant feeling pleasantly stuffed and torpid. He turned left toward the nearest booth, a block away.

The Walters case had haunted him all through dinner. Fisher had made a good deal of sense . . . but what bugged him was something Fisher hadn't said. Fisher hadn't said that Hennessey might be looking for easy answers.

Easy? If Walters had killed Alicia during a game of dominoes at the Sirius Club, then there wouldn't *be* any case until Larimer remembered. Aside from that, Walters would have been an idiot to try such a thing. Idiot, or desperate.

But if someone else had killed her, it opened up a bag of snakes. Restrict it to members of the Sirius Club who were there that night, and how many were left? They'd both done business there. How many of Jeffrey Walters' acquaintances had shared Alicia's bed? Which of them would have killed her, for reason or no reason? The trouble with sharing too many beds was that one's chance of running into a really bad situation was improved almost to certainty.

If Walters had done it, things became simpler.

But she hadn't bled much.

And Walters couldn't have had reason to move her body to his home. Where could he have killed her that would be worse than that?

Walters owned the murder weapon . . . no, forget that. She could have been hit with anything, and if she were in Walters' house fifteen seconds later she might still be breathing when the malachite box finished the job.

Hennessey slowed to a stop in front of the booth. Something Fisher *had* said, something that had struck him funny. What was it?

"Her displacement booth must be ten years old—" That was it. The sight of the booth must have sparked that memory. And it *was* funny. How had he known?

JumpShift booths were all alike. They had to be. They all had to hold the same volume, because the air in the receiver had to be flicked back to the transmitter. When JumpShift improved a booth, it was the equipment they improved, so that the older booths could still be used.

Ten years old. Wasn't that—yes. The altitude shift. Pumping energy into a cargo, so that it could be flicked a mile or a hundred miles uphill, had been an early improvement. But a transmitter that could absorb the lost potential energy of a downhill shift, had not become common until ten years ago.

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Hennessey stepped in and dialed the police station.

Sergeant Sobel was behind the desk. "Oh, Fisher left an hour ago," he said. "Want his number?"

"Yes . . . no. Get me Alicia Walters' number."

Sobel got it for him. "What's up?"

"Tell you in a minute," said Hennessey, and he flicked out.

It was black night. His ears registered the drop in pressure. His eyes adjusted rapidly, and he saw that there were lights in Alicia Walters' house.

He stepped out of the booth. Whistling, he walked a slow circle around it.

It was a JumpShift booth. What more was there to say? A glass cylinder with a rounded top, big enough for a tall man to stand upright and a meager amount of baggage to stand with him—or for a man holding a dead woman in his arms, clenching his teeth while he tried to free one finger for dialing. The machinery that made the magic was buried beneath the booth. The dial, a simple push-button phone dial. Even the long distance booths looked just like this one, though the auxiliary machinery was far more complex.

"But he was sweating—" Had Lovejoy meant it literally?

Hennessey was smiling fero-

in times to come Despite the energy crisis, long-distance trucking will be a major means of moving goods across the US for some time to come. Next month's lead novelette, "Catalyst Run" by Jesse Miller, takes a deep look at the men who drive the trucks of the future—and the forces that drive such men. The cover painting is by Jack Gaughan, and it brings into clear focus one of the little-realized factors of science fiction: although our field has not been racist, it has been almost exclusively white. Jesse Miller's first published story, "Pigeon City," in the November 1972 issue, dealt with the future of the ghetto. Here he deals with a nonracial theme . . . blackly.

Joe Allred contributes a Guest Editorial next month, "Frankenstein Phobia." A medical researcher in Texas (and author of "When I Was in Your Mind," in our December 1972 issue), Allred takes umbrage at the short-sighted alarmists who tremble at the recent advances in genetics and biochemistry. His Guest Editorial makes you realize that if Dr. Victor Frankenstein had existed in reality—instead of merely in the imagination of a poet's 20-year-old wife—his work would have advanced medical knowledge enormously instead of giving rise to a succession of horror movies.

Tak Hallus will be back with "Laws and Orders," a sequel to his earlier "Force Over Distance" and a *prequel* to his upcoming serial . . . all of them about the Jenson matter-transmitter and its effect on people and society.

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ciously as he stepped back into the booth.

The lights of the Homicide Room flashed in his eyes. Hennessey came out tearing at his collar. Sweat started from every pore. Living in the mountains like that, Alicia should certainly have had her booth replaced. The room felt like a furnace, but it was his own body temperature that had jumped seven degrees in a moment. Seven degrees of randomized energy, to compensate for the drop in potential energy between here and Lake Arrowhead.

Walters sat slumped, staring straight ahead of him. "She didn't understand and she didn't care. She was taking it like we'd been all through this before but we had to do it again and let's get it over with." He spoke in a monotone, but the nervous stutter was gone. "Finally I hit her. I guess I was trying to get her attention. She just took it and looked at me and waited for me to go on."

Hennessey said, "Where did the malachite box come in?"

"Where do you think? I hit her with it."

"Then it was hers, not yours."

"It was ours. When we broke up, she took it. Look, I don't want you to think I wanted to *kill* her. I wanted to scar her."

"To scare her?"

"No! To scar her!" His voice rose. "To leave a mark she'd remember every time she looked in a mirror, so she'd know I meant it, so she'd leave me alone! I wouldn't have cared if she sued. Whatever it cost, it would have been worth it. But I hit her too hard, too hard. I felt the crunch."

"Why didn't you report it?"

"But I did! At least, I tried. I picked her up in my arms and wrestled her out to the booth and dialed for the Los Angeles Emergency Hospital. I don't know if there's anyplace closer, and I wasn't thinking too clearly. Listen, maybe I can prove this. Maybe an intern saw me in the booth. I flicked into the hospital, and suddenly I was broiling. Then I remembered that Alicia had an old booth, the kind that can't absorb a difference in potential energy."

"We guessed that much."

"So I dialed quick and flicked right out again. I had to go back to Alicia's for the malachite box and to wipe off the sofa, and my own booth *is* a new one, so I got the temperature shift again. God, it was hot. I changed suits before I went back to the Club. I was still sweating."

"You thought that raising her temperature would foul up our estimate of when she died."

"That's right." Walters' smile was wan. "Listen, I did try to get her to a hospital. You'll remember that, won't you?"

"Yeah. But you changed your mind." ■

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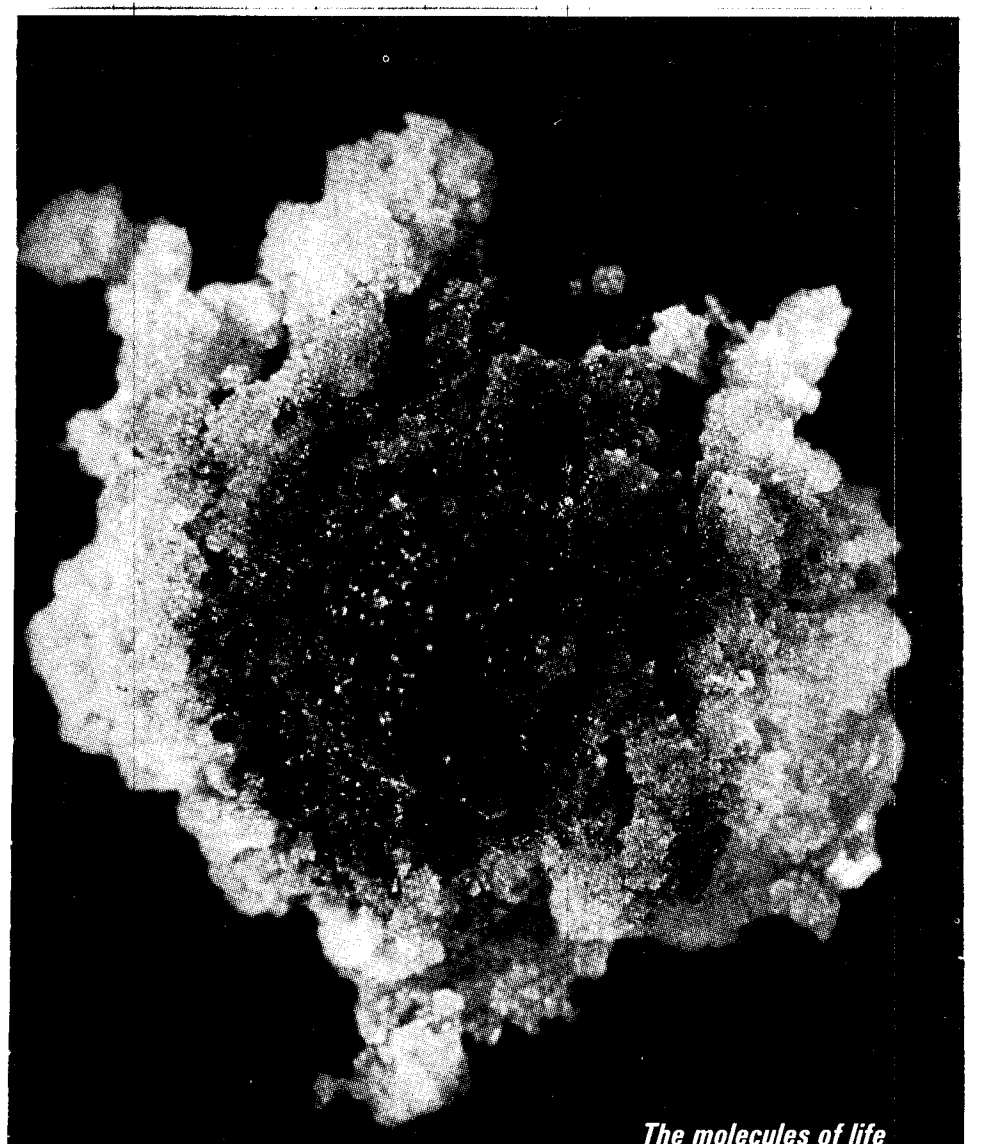

The molecules of life are an integral part of every new-born solar system.

extraterrestrial organic matter

LOUIS LENHARD

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That life exists elsewhere than Earth is a basic assumption of much science fiction. The scientific evidence for that possibility, though, has not been available until rather recently.

Our working assumption will be that organic matter is presumptive evidence of the possibility of life. While admitting the potential for organic matter from nonliving (abiogenic) processes, we may take the existence of organic matter at least as life evolving if not life in actuality. Thus, one direct evidence for the possibility for the existence of extraterrestrial life is the identification of extraterrestrial organic matter. Analyses of meteorites, especially those known as carbonaceous chondrites, and recent studies in radio astronomy have shown that extraterrestrial organic matter does indeed exist.

In speculations about the possibility of life elsewhere in our universe, there are two main schools of thought. The first theory, often held by astronomers, takes the position that, since the universe is so large, Earth-like environments almost certainly exist elsewhere. This view also assumes that, given Earth-like conditions, life will develop. We may call this view of evolution the "life is inevitable theory"; it assumes that life will develop wherever chemical evolution leads to organic molecules.

The other theory, commonly held by biologists and especially by paleontologists, states that the evolution of life is a *very* unlikely event. This view considers that event so rare, that Earth life is thought to be unique in the universe. This idea is based on considering the mathematical probability (estimated) of each step in evolution, and then calculating the total probability of life developing. The number derived, needless to say, is extremely small. We may call this view the "Earth life is unique theory."

Until rather recently there has been no evidence for or against either of these two theories, only speculations. Both views seemed reasonable and neither could be disproven. However, we now have some hard scientific data that relates to the question of extraterrestrial life. Although it is as yet fragmentary and inconclusive, in my opinion the present evidence favors the "life is inevitable theory," especially when related to terrestrial studies of chemical evolution.

In the search for extraterrestrial organic matter as evidence for the possibility of nonterrestrial life, there are two general approaches: (1) the study of nonterrestrial mat-

Interplanetary agriculture! In the NASA photo on the previous page, a soybean tissue culture is alive and well in a mixture of laboratory nutrient and lunar soil returned by the Apollo 15 astronauts.

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ter by direct chemical analysis, and (2) the study of nonterrestrial matter by spectroscopy (*e.g.*, by microwave emissions from space detected by a radio telescope). The first approach is possible because we do have extraterrestrial matter: meteorites and Moon rocks. The second approach, which provides more indirect evidence, is possible because of improvements in radio astronomy in the last ten years.

Since meteorites were first studied in this regard, let us consider them first.

Organic Matter in Meteorites

Of the various types of meteorites known, only those called carbonaceous chondrites contain organic matter. Typically having a carbon content of about three percent, approximately thirty such meteorites have been found. They are dark and dull in color, friable, have a relatively low density, and contain little or no free nickel and iron. In age they vary from 1,300 to 4,500 million years.

The first carbonaceous chondrite that was correctly identified as such fell near Alais, France in 1806. Soon after its recovery it found its way into the hands of the great Swedish chemist Berzelius. In his analysis Berzelius identified carbon compounds (organic matter). Indeed, the meteorite's composition varied so greatly from that of other meteorites that Berzelius had examined, that he did not completely believe that it was a meteorite.

Contemporaries of Berzelius, and later Nineteenth Century scientists, expressed doubt that carbonaceous chondrites contained biogenic organic matter. A noteworthy exception was the German chemist Wohler (the first to synthesize an organic compound in the laboratory) who believed that the carbon content of the meteorite was "undoubtedly of organic origin." Since these chemists were working before the publication of Darwin's *Origin of Species* (1859) it is not surprising that meteoritic organic matter would seem anomalous to them.

Modern studies of organic compounds in meteorites did not begin until the late 1950's. Since then the number of reports has been steadily increasing.

Before getting to the kinds of organic molecules found in meteorites, let us consider the evidence for their extraterrestrial origin. (It should be noted that the finding of organic matter in a meteorite is not necessarily proof of extraterrestrial life. The organic matter may be: (1) terrestrial contamination, or (2) extraterrestrial matter of abiogenic origin.) The hypothesis that organic molecules found in meteorites are of extraterrestrial origin is based on the following types of evidence.

1. Optical activity in amino acid isomers. Terrestrial organic matter such as amino acids are commonly

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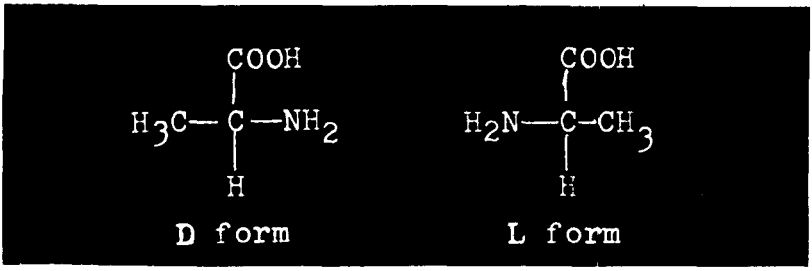

Figure 1: Stereoisomers of a simple amino acid, alanine.

dextrorotatory (or in the D-form), that is, a beam of plane polarized light passing through them is bent to the right. Meteoritic amino acids are levorotatory (in the L-form which bends such light to the left) or are a mixture of both types.

2. "New" meteorites. Organic matter has been found in carbonaceous chondrites that have only recently "fallen" onto the Earth's surface.

3. Isotopic composition. The ratio of different isotopes of hydrogen (H-2:H-1) and carbon (C-13:C-12) differs in meteoritic organic matter from terrestrial organic matter.

4. Internal distribution of volatile hydrocarbons. Organic hydrocarbons which readily boil away (*e.g.*, during passage through the Earth's atmosphere) are in greater concentration on the inside of carbonaceous chondrites than on the outside. The converse should be true if the hydrocarbons are terrestrial contaminants.

5. Aromatic-aliphatic ratio Aromatic molecules (carbon compounds containing ring structures, such as benzene) are more abundant in relation to nonaromatics (aliphatics) in carbonaceous chondrites than in Earth samples.

6. Unique compounds. Organic compounds have been found in meteorites which have not been found anywhere else.

7. Carbonaceous vs. noncarbonaceous meteorites. If organic compounds found in carbonaceous chondrites are due to terrestrial contamination, then noncarbonaceous meteorites should also contain organic compounds. They do not.

Let us next consider the types of organic molecules found in carbonaceous chondrites (see also Table 1).

Aliphatic compounds. Organic (carbon-containing) compounds which do not contain ring structures are known as aliphatics (such as alcohols). Such compounds have been the types most commonly found in chemical analyses of carbonaceous chondrites. Specific compounds have been identified which range from simple one and two carbon types to complex 26 carbon

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Table 1. Organic Matter in Meteorites: Representative Findings

Class of organic compounds	specific molecules identified	meteorite	author and date
Aliphatic	CS_2; CO_2; ethyl acetate	Murray	Hayes and Biemann, 1968
Aliphatic	isoprenoids; monomethylalkanes; n-paraffin	Esseki; Grosnaja; Mokoia; Murray; Orgueil; Viguruna	Gelpi and Oro, 1970
Aromatic	toluene; xylene	Murray	Hayes & Biemann, 1968
Aromatic	cyclohexanes	Cold Bokkenveld	Commins & Harrington, 1966
Aromatic	benzene; toluene; chlorobenzenes	Murchison; Allende	Studier, 1972
Fatty acids	C_{14}-C_{17} fatty acids	Orgueil	Nagy & Bitz, 1963
Amino acid	aspartic acid; beta-alanine isovaline pipecolic acid	Murchison	Kvenvolden, 1971
Amino acid	glycine; alanine; glutamic acid; valine; proline	Murchison	Kvenvolden, 1970
Porphyrin	specific type unknown	Orgueil; Murray; Cold Bokkeveld; Mokoia	Hodgson and Baker, 1964 and 1969
Purine	guanine; symtriazine	Orgueil	Hayatsu, 1964

paraffins. Both saturated and unsaturated compounds (*i.e.*, with and without double bonds between adjacent carbon atoms) have been found. For example, the study by Levy (*Nature* v. 227, p. 148, 1970) on the Pueblito de Allende meteorite which fell in Mexico in 1969 identified 16 types of organic compounds, most of them aliphatic.

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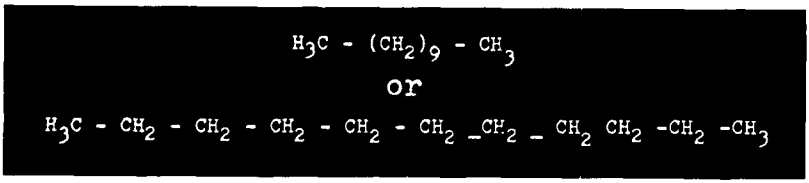

Figure 2: Undecane. An n-paraffin found in a variety of carbonaceous chondrites.

Aromatic compounds. Aromatic molecules contain a ring structure. In simple aromatics there is only one ring (monocyclic). More complex types (polycyclics) also exist. Both monocyclic and polycyclic organic compounds occur in meteorites. One extensive comparative study found aromatic hydrocarbons in all the 21 carbonaceous chondrites examined. A recent study (*Geochimica et Cosmochimica Acta* v. 36, p. 189, 1972) found both simple (*e.g.*, benzene and toluene) and complex aromatics (*e.g.*, porphyrin-like compounds, discussed below) in the Murchison and Allende meteorites, both of which have recently fallen to Earth.

Lipids. Lipids (also called fats and oils) are non-water-soluble compounds that contain fatty acids as a basic part of their structure. Fatty acids are long chains of carbon with an acidic moiety attached. The Orgueil meteorite, perhaps the most extensively studied carbonaceous chondrite, contains fatty acids (*Biochimica et Biophysica Acta* v. 101, p. 240, 1963). Terrestrial contamination is unlikely because of the dissimilarity of the meteoritic fatty acids from those found in Earth samples. Also, a noncarbonaceous meteorite (Holbrook) showed no trace of fatty acids.

Proteins. The basic subunit molecules of proteins are amino acids. There have been several reports of amino acids occurring in carbonaceous chondrites. One of the

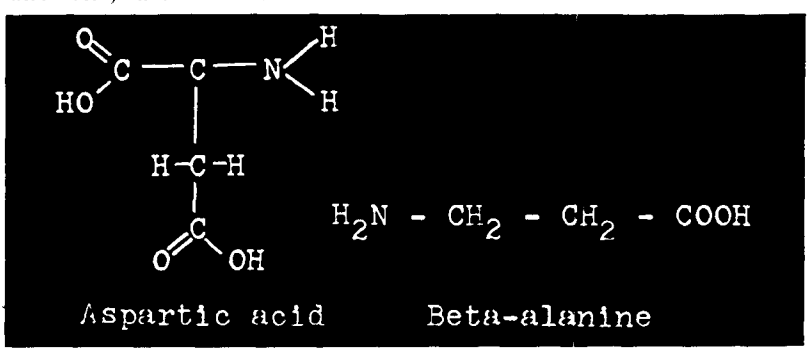

Figure 3: Amino acids found in the Murchison meteorite.

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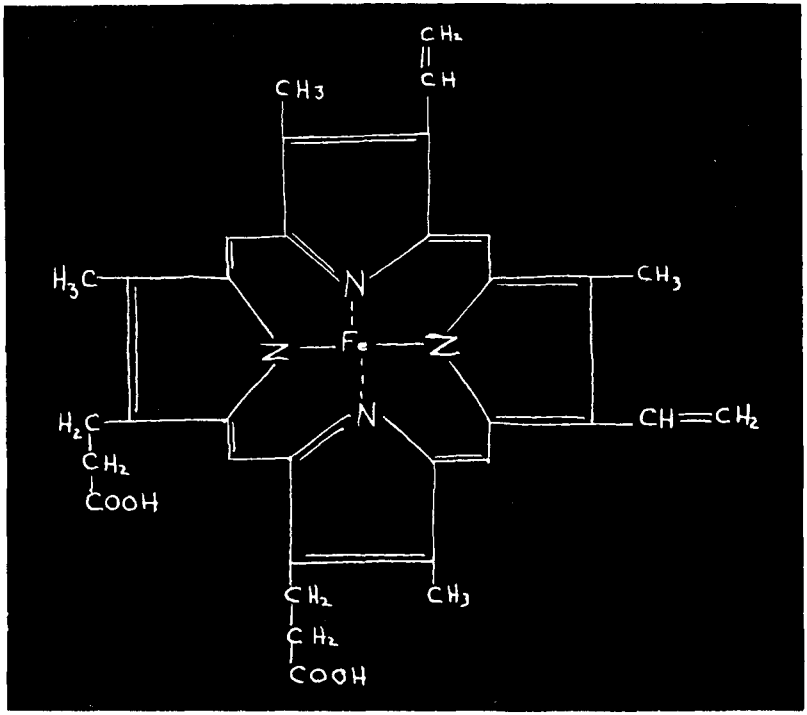

Figure 4: Protoporphyrin IX. Porphyrins have been identified in the Orgueil meteorite. (Intersecting lines represent the location of a carbon atom).

more recent found nine different amino acids in the Murchison meteorite (*Proc. Natl. Acad. Sci.* v. 68, p. 486, 1971). This report supplemented a previous paper in which five other amino acids had been identified in the chondrite. Of this total of 14 amino acids, some are similar to those found in terrestrial life (*e.g.*, aspartic acid) and others differ from the usual types of terrestrial amino acids (*e.g.*, beta-amino-n-butyric acid).

Nucleic acids. The genetic material of terrestrial life is in the form of DNA (or RNA). One structural unit of nucleic acids such as DNA is a purine, a dicyclic nitrogen-containing molecule. An analysis of the Orgueil meteorite showed the presence of purines (*Science* v. 146, p. 1291, 1964).

Porphyrins. Porphyrins are tetracyclic compounds that are a basic part of various organic pigments associated with life. For example, porphyrin complexed with iron or magnesium is the nonprotein part of hemoglobin and chlorophyll. Several analyses have found por-

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phyrins in meteorites. One such study found porphyrin-metal complexes in the four different carbonaceous chondrites studied (*Geochimica et Cosmochimica Acta* v. 33, p. 943, 1969). Their nonterrestrial origin is indicated by (1) a fluorescence different than that of terrestrial porphyrins, and (2) their absence in noncarbonaceous meteorites.

Fossils. The most intriguing, exciting and without question most controversial claim that has been made about carbonaceous chondrites is that they contain microscopically visible remnants of life (microfossils). First reported in 1961 by Claus and Nagy (*Nature* v. 192, p. 594), the claim aroused considerable activity. At least 15 other reports on the subject appeared in the next two years, mostly in the British journal *Nature.* Based primarily on morphological evidence (*i.e.,* appearance), Claus and Nagy identified five types of "organized elements" as they called them. These structures seemed to the authors to take up biological stains specific for various biochemicals (such as lipids and proteins). Further studies by Nagy (*Nature* v. 193, p. 1129, 1962; v. 198, p. 121, 1963) extended these observations. (Readers are referred to the original papers for photographs of these organized elements.) However, other investigators did not agree with Nagy. The consensus was that Nagy's organized elements were mineral particles that happen to resemble microfossils (*e.g.*, see *Science* v. 138. p. 1391, 1962). Also, some—botanists in particular—pointed out the great similarity of some of Nagy's structures to known terrestrial plant spores, implying terrestrial contamination. Not much has been written of these organized elements since 1963.

What conclusions, then, can be drawn from all of this work? The question of extraterrestrial origin versus terrestrial contamination has been settled, I think, in favor of extraterrestrial origin. This is not to say that all reports have had positive results, or that all reports claiming extraterrestrial organic matter have gone unchallenged. Indeed, a number of contradictory findings exist. Overall, though, carbonaceous chondrites have been shown to contain organic compounds, of both simple and complex types, that come from off Earth.

The origin of these compounds cannot as yet be satisfactorily explained. One can account for these compounds by both known abiotic processes (the Fischer-Tropsch reaction, and the various laboratory syntheses in the study of chemical evolution) and, of course, by biotic (life) processes.

Organic Matter on the Moon

The bringing of Moon rocks to Earth provided an opportunity to

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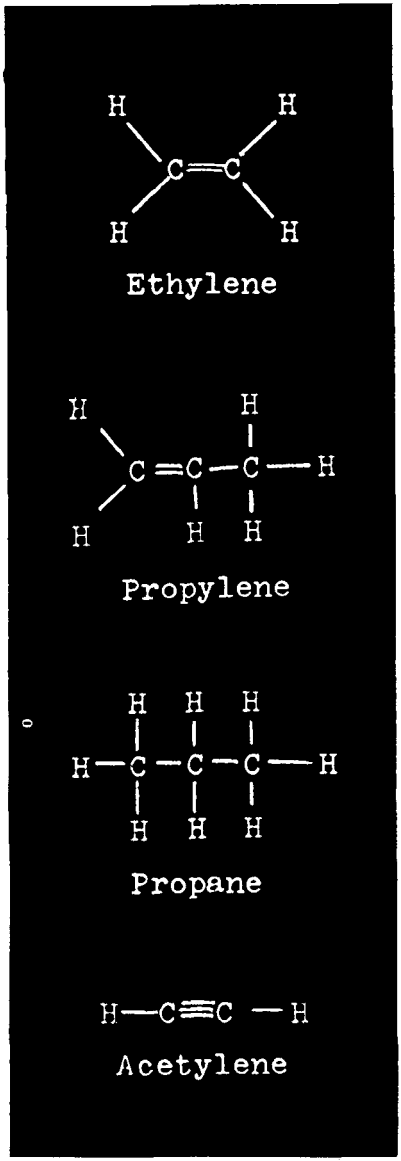

Figure 5: Organic molecules found on the Moon.

look not only for organic matter of unequivocal extraterrestrial origin, but also living organisms themselves. Accordingly, great care was exercised to prevent contamination of the lunar samples. Although the study of the now voluminous Moon rocks has only really begun, the results so far are not encouraging for the search for extraterrestrial life.

No good evidence for living organisms on the Moon has been found. Organic matter, though, has been. To date, only a few simple types have been identified, such as ethylene (C_2H_4), propane (C_3H_8), propylene (C_3H_6) and acetylene (C_2H_2). The overall carbon content of the lunar rocks is about 200 parts per million.

Nothing more can be said about the Moon's organic components at this time.

Organic Molecules in Space

If organic matter exists off Earth, it is not surprising to find it in the remnants of a planet or in a planet's satellite (*i.e.*, in a meteorite or on the Moon). But the finding of organic molecules in space itself would be most unexpected. Yet, that is exactly what has been discovered by radio astronomy in the last decade.

The ability of scientists to study the chemical composition of interstellar regions is possible because of the invention of spectroscopy. In the early Nineteenth Century Joseph von Fraunhofer developed a de-

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vice, the spectroscope, which could identify the various components, or bands, in the light emissions of an energy source.

Atoms and molecules may undergo internal changes, the result of which is the emission of electromagnetic energy with a distinctive spectrum of wavelengths and frequency. Early spectroscopes could detect visible emissions (*i.e.*, visible light). Studies on Earth soon identified the characteristic spectra of a wide variety of chemical entities. It became possible, then, to determine the composition of an unknown sample by the study of its spectrum.

The possibility of using the spectroscope to study the chemical composition of space was soon recognized by physicists and astronomers. Von Fraunhofer himself directed his invention to the analysis of light from extraterrestrial sources. Although he did not utilize the spectral analyses to study the chemical composition of space, von Fraunhofer may nevertheless be considered to be the founder of astronomical optical spectroscopy. It was left to Gustav Kirchhoff and Robert Bunsen, two other Nineteenth Century German physical scientists, to begin the actual analysis of space by Earthbound optical spectroscopy.

In 1842 Edmond Becquerel discovered the ultraviolet part of the electromagnetic spectrum during his work in solar photography. This led to a search for and an identification of an even wider range of radiations than had been previously known.

In more recent times the longer wavelength radio waves have been discovered. Such radio emissions can also be detected from extraterrestrial sources. As with early studies in optical spectroscopy, laboratory work with radio emissions (that is, radio spectroscopy) has identified the characteristic emissions of different atoms and molecules. Thus the radio wave spectrum from outer space can also be used in the chemical analysis of extraterrestrial matter. Since the microwaves that compose this part of the radio spectrum easily traverse areas often opaque to light, the development of microwave spectroscopy has greatly expanded our ability to study the chemical composition of other planets, stars and interstellar space.

Knowing, then, at what frequencies and wavelengths to examine space for various molecules, radio astronomers have looked for and found evidence of free molecules, including organic molecules, in the interstellar medium.

The greatest activity in searching space for free organic molecules has been since 1963 when free hydroxyl (OH) was found in the interstellar medium. But the idea that there were interstellar molecules was suggested as long ago as 1937 by Swings and others. Swings ten-

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Table 2. Molecules in Space: An Outline of Representative Findings.

Molecule searched for	result	source	author & date
OH	+	Cas A	Weinreb, 1963
OH	+	Crab nebula	Robinson, 1964
		Orion nebula	
H_2O	+	Sgr B2	Cheung, 1969
		Orion	
		W49	
NH_3	+	Galactic center	Cheung, 1968
CO	+	Orion	Wilson, 1970
CO		10 different sources	Penzias, 1971
H_2CO	+	15 diff. sources	Snyder, 1969
H_2CO	+	4 dark nebula	Palmer, 1969
H_2CO	+	20 diff. sources	Zuckerman, 1970
H_2CO	+	Sgr B	Zuckerman, 1969
		Sgr A	
		W51	
H_2CS	-	Sgr A	Davies, 1971
		Sgr B2	
		M17	
		Cas A	
NH_2CHO	+	Sgr B2	Benson, 1971
H_3COH	+	Sgr A	Ball, 1970
		Sgr B2	
HC_3N	+	Sgr B2 (negative for 16 other sources)	Turner, 1971
SiO	+	Sgr B2 (negative for 6 other sources)	Wilson, 1971

tatively identified two frequencies in the spectrum (6,614 MHz and 6,284 MHz) that were detected from space as belonging to carbon dioxide. In the same year Swings and Rosenfield hypothesized stellar CH, OH, NH, CN and C_2.

In 1963 Weinreb *et al.* (*Nature* vol. 200, p. 829) identified interstellar hydroxyl in the 18 cm. absorption line. At the Millstone Observatory of MIT they detected OH from a source in Cassiopeia A (Cas A). Several subsequent reports confirmed their findings and increased the number of known sources of OH emission (see Table 2). A recent paper has shown that OH is

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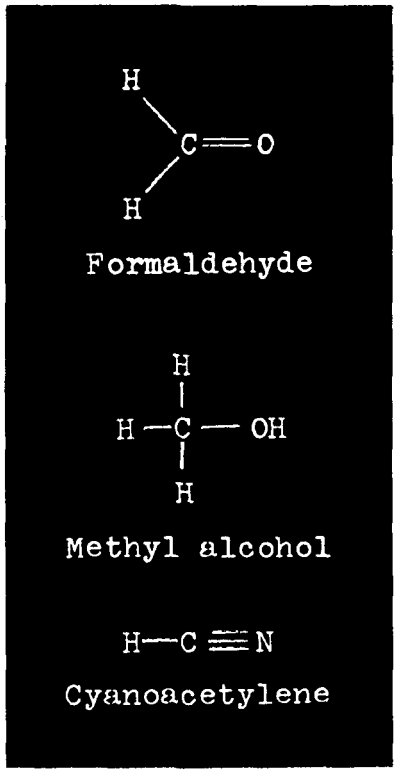

Figure 6: Some organic molecules identified from protostar regions of interstellar space.

distributed discretely; it is found only in certain places. Assuming a temperature of 0.5-10°K it has been estimated that OH exists at a density of 3 x 10^{17} molecules per cm^3.

For life to exist or evolve there is a requirement not only for organic molecules but also for certain inorganic molecules, such as water, ammonia, et cetera.

Water has been found in space, as water vapor "clouds." First discovered in 1969, microwave emissions at a frequency corresponding to water have been identified from Sagittarius B (Sgr B) and other sources. Water density in these "clouds" is estimated to be about 10^{14} molecules per cm^3.

Ammonia (NH_3) and carbon monoxide (CO) also occur in space. Ammonia has been detected at a density of about 2 x 10^6 per cm^3. Carbon monoxide, discovered in space in 1970, was detected by radio astronomers at the National Radio Astronomy Observatory at Green Bank, West Virginia. CO occurs in the Orion nebula and is especially abundant near interstellar H_{II} regions. It is estimated to occur at a density of about a thousand molecules per cm^3. The CO occurs with various isotopic forms of carbon (C-12, C-13 and C-14).

All of the above molecules that have been found are characteristic of both living and abiotic conditions. Their significance in space is not known for certain. Perhaps some future spacefarers can "farm" them. If so, one might speculate about the effects on evolving interstellar life, which presumably would be developing very slowly due to low space temperatures.

Organic molecules have also been discovered in space by radio astronomers. Formaldehyde (H_2CO) has been most studied. The first report appeared in 1969 with others following in rapid succession. Emitting at the 4,830 MHz

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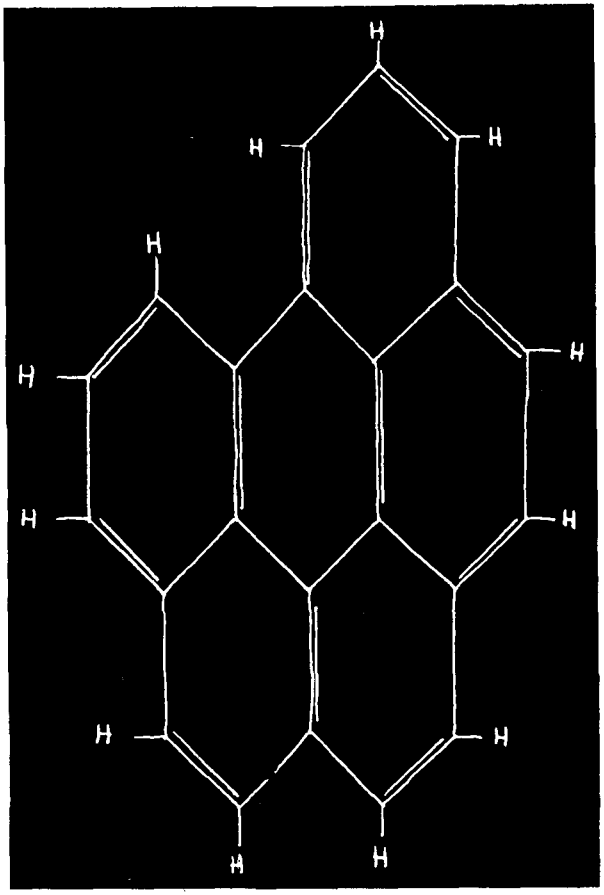

Figure 7: A polycyclic hydrocarbon. Intersections represent carbon atoms. There is evidence for such compounds, which are precursors of graphite, in space.

frequency, H_2CO occurs in numerous galactic and extragalactic sites. It was the first organic molecule discovered in space and its widespread distribution is as intriguing as its organic nature. Formaldehyde and OH are frequently (always?) found together, usually in a constant ratio. (Does that imply an equilibrium of some specific interstellar chemical reaction?)

A formaldehyde-related molecule, thioformaldehyde (H_2CS), has also been sought, but has not been found in space.

Other organic molecules identified by radio astronomy include:

1. Polycyclic hydrocarbons. These compounds, such as one made of six benzenes bound together, occur

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in space. Since this is a precursor of graphite, extensive (relatively speaking) amounts of carbon may exist in space.

2. Formamide (NH_2CHO). The finding of this molecule is especially significant in terms of the evolution of life. Formamide contains an amino (NH_2) function which is a universal characteristic of amino acids and nucleic acid subunits.

3. Methyl alcohol (CH_3OH). It has been found in the 36 cm band from a source in Sgr B2.

4. Cyanoacetylene (HCN). This is the only life-related molecule so far found in space which is unsaturated, or has a double bond. Its nitrogen content is also noteworthy.

The meaning of this diversity of molecules in space can only be speculated on. While it is very difficult to think of life evolving at the temperature of interstellar space, the existence of H_2O, NH_3, alcohols, amides, et cetera, which are all life-related molecules certainly piques the imagination.

Also striking and intriguing is the distribution of these molecules in space. Most, and possibly all, life-related molecules identified in space occur in regions that are especially rich in particulate interstellar matter. These regions are thought to be the site of developing stars, and in fact are identified as "protostars." It may very well be, then, that the evolution of a star and its associated planetary system is always accompanied by the evolution of life.

But even if these molecules are abiogenic in origin, their occurrence in space is remarkable. Undoubtedly the near future will see the list of extraterrestrial, interstellar organic molecules extended.

Conclusion

In the 1930's the Russian biochemist A.I. Oparin proposed his brilliant and precocious theories about chemical evolution as a prelude to the evolution of life. In 1953 Miller and Urey, working at the University of Chicago, showed that chemical evolution can be studied in the laboratory. Since then a huge mass of data has accumulated from such studies. Indeed, some investigators are consciously trying to develop an evolution of life in their laboratories.

Biologists, especially those working at the level of cells or biochemicals, have become very mechanistic and even deterministic in their views of life and its origin. That life has evolved elsewhere than Earth is widely considered to be highly likely.

These terrestrial biological studies cannot prove that extraterrestrial life exists, only that it may. Future space exploration will finally answer the question. Until then, our study of meteorites, Moon rocks and radio astronomy provide our most direct path in the search for extraterrestrial life.

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ABOUT THE AUTHOR

Louis Lenhard taught biology at the university level in Florida and Kansas before he decided, while working on a doctorate at Notre Dame, to earn his living as a free-lance writer specializing in science.

do you know your chemistry terms?

by JOSEPH STACEY

Can you match them up—the terms pertaining to chemistry on the left with the brief descriptions and/or explanations on the right? Seven correct answers is passing; 8-to-10 is good; 11-12 is excellent.

_____ 1. AGENT	A. to heat intensely
_____ 2. GROUP	B. a compound which reacts with an acid to form salt
_____ 3. HEAVY	C. exhibiting neither acid nor alkaline qualities
_____ 4. HYDRATE	D. a substance which causes a reaction
_____ 5. MONATOMIC	E. to convert fat into soap by treating with an alkali
_____ 6. NEUTRAL	F. referring to that isotope of greater atomic weight
_____ 7. IGNITE	G. a substance obtained from another substance through chemical change
_____ 8. SAPONIFY	H. having one atom in a molecule
_____ 9. PRODUCT	I. to combine chemically with water
_____ 10. BASE	J. a number of atoms in a molecule connected or arranged together in some special manner

answers on page 95

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the time-traveler

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Of course we should have been expecting it. I guess the people at Callahan's read newspapers just like other folks, and there'd even been a discotheque over on Jericho hit three days earlier. But somehow none of us was prepared for it when it came.

Well, how were we to know? It's not that Callahan's Place is so isolated from the world that you never expect it to be affected by the same things. God knows that most of the troubles of the world, old and new, come through the door of Callahan's sooner or later—but they usually carry a dollar bill, not a .45 automatic. Besides, he was such a shrimpy little guy.

And on top of everything, it was Punday Night.

Punday Night is a weekly attraction at Callahan's—if that's the word. Folks who come into the place for the first time on a Tuesday evening have been known to flee screaming into the night, leaving full pitchers of beer behind in their haste to be elsewhere. There's Sunday, see, and then there's Monday, and then there's Punday. And on that day, the boys begin assembling around seven-thirty, and after a time people stop piddling around with drafts and start lining up pitchers, and Fast Eddie gets up from his beat-up upright piano and starts pulling tables together. Everyone begins ever-so-casually jockeying for position, so important on Punday Night. Here and there the newer men can be heard warming up with one another, and the first groans are heard.

"Say, Fogerty. I hear tell Stacey Keach was engaged to the same girl three times—every time the Big Day came due, she decided she couldn't stand him."

"Do tell."

"Yup. Then the late Harry Truman hisself advised her. He said, 'Gal, if you can't stand the Keach, get out of the hitchin.' "

And another three or four glasses hit the fireplace.

Of course the real regulars, the old-timers, simply sit and drink their beer and conserve their wit. They add little to the shattered welter of glass that grows in the fireplace—though the toasts, when they make them, can get pretty flashy.

Along about eleven Doc Webster comes waddling in from his rounds and the place hushes up. Doc suffers his topcoat and bag to be taken from him, collects a beer mug full of Peter Dawson from Callahan, and takes his place at the head of the assembled tables like a liner coming into port. Then, folding his fingers over his great belly, he addresses the group.

"What is the topic?"

At this point the fate of the evening hangs in the balance. Maybe you'll get a good topic, maybe you won't—and the only way to explain what I mean is by example:

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"Fast Eddie," says Callahan, "how 'bout a little inspirational music?"

"That would bring the problem into *scale*," says Doc Webster, and the battle is joined.

"I had already *noted* that," comes the hasty riposte from Shorty Steinitz, and over on his right Long-Drink McGonnigle snorts.

"You overheard that at the *staff* meeting," he accuses, and Tommy Janssen advises him to take a rest, and by the time Callahan can point out that "this ain't a music-hall- it's a bar," they're off and running. Once a topic is established, it goes in rotation clockwise from Doc Webster, and if you can't supply a stinker on the spot when your turn comes up, you're out. By one o'clock in the morning, it's usually a tight contest between the real pros, all of them acutely aware that anyone still in the lists by closing gets his night's tab erased. It has become a point of honor to drink a good deal on Punday Night to show how confident you are, and when I first noticed this and asked Callahan whose idea Punday had been in the first place, he told me he couldn't remember. One smart fella, that Callahan.

This one night in particular had used up an awful lot of alcohol, and one hell of a lot of spiritual fortitude. The topic was one of those naturals that can be milked for hours: electricity. It was about one-fifteen that the trouble started.

By this point in a harrowing evening, the competition was down to Doc, Noah Gonzales and me. I was feeling decidedly pun-chy.

"I have a feeling this is going to be a good round Fermi," Doc rumbled, and sent a few ounces of Scotch past an angelic smile.

"You've galvanized us all once again, Doc," said Noah immediately.

"Socket to me," I agreed enthusiastically.

Doc made a face, no great feat considering what he had to work with, and glared at me. "Wire you debasing this contest with slang?" he intoned.

"Oh, I don't know," interceded Noah, "it seems like an acceptable current usage to me."

"You see, Doc?" I said desperately, beginning to feel the strain now, "Noah and I seem tube be in agreement."

But Doc Webster wasn't looking at me. He wasn't even looking in my direction, he was staring fixedly over Noah's right shoulder. "I regret to inform you all," he said with the utmost calm, "that the gent at the bar is *not* packing a lightning rod."

About thirty heads spun around at once, and sure enough, there was a guy in front of the bar with a .45 automatic in his hand, and Callahan was staring equably into the medicine end. He was holding out a salt-shaker in his huge horny fist.

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"What's that for?" demanded the gunman.

"Might as well salt that thing, son. You're about to eat it."

Now your run-of-the-mill stickup artist would react to a line like that by waving the rod around a little, maybe even picking off the odd bottle behind the bar. This fellow just looked more depressed.

He didn't *look* like a stickup artist if it comes to that; I'd have taken him for an insurance salesman down on his luck. He was short, slight, and balding, and his gold-rimmed glasses pinched cruelly at his nose. His features were utterly nondescript, a Walter Mitty caricature of despair, and I couldn't help remembering that a number of our more notable assassins have been Walter Mitty types.

Then I saw Fast Eddie over at the piano slide his hand down to his boot for the little blackjack he carries for emergencies, and began trying to remember if my insurance was paid up. The scrawny gunman locked eyes with Callahan, holding the cannon steady as a rock, and Callahan smiled.

The guy with the gun ran out of determination all at once and lowered the piece, looking around him vaguely. Callahan pointed to the fireplace, and the guy nodded his thanks. The gun described a lazy arc and landed in the pile of glass with a sound like change rattling in a pocket.

You might almost have thought the gun had shattered a window that kept out a storm, but the whooshing sound that followed was really only the noise of a couple dozen guys all exhaling at the same time. Fast Eddie's hand slid back up his leg, and Callahan said softly, "You forgot the toast, friend."

I expected that to confuse the guy, but it seemed he knew *something* about Callahan's Place after all, because he just nodded and made his toast.

"To progress."

I could see people all up and down the bar firing up their guessers, but nobody opened his trap. We waited to see if the guy felt like telling us what his beef with progress was, and when you understand that you will have gone a long way toward understanding what Callahan's Place is really all about. I'm sure anywhere else folks'd figure that a man who'd just waved a gun around owed 'em an explanation, if not a few teeth. We just sat there looking noncommittal and hoping he'd let it out.

He did.

"I mean, progress is something with no pity and no purpose—it just happens. It chews up all you ever knew and spits out things you can't understand and the only value it seems to have is to make a few people a lot of money. What the hell is the sense of progress, anyway?" he finished savagely.

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"Keeps the dust off ya," said Slippery Joe Maser seriously. Now Joe, as you know, has two wives, and there sure as hell ain't no dust on him.

"I suppose you're right," said the clerical-looking burglar, "but I'd surely appreciate a little dust just at the moment. I was hip-deep in it for years, and I didn't know how well off I was."

"Well, take this to cut it with," said Callahan, and held out a gin-and-gin. As he handed it over, his other hand came up from behind the bar with a sawed-off shotgun in it. "I'll be damned," said Callahan, noticing it for the first time, "forgot I had that in my hand." He put it back under the bar, and the balding bandit swallowed.

"Now then, brother, pull up a chair and tell us your name, and if you've got troubles I never heard before I'll give you the case of your choice."

"Make it I. W. Harper."

"Pleased to meet you, Mr. Harpooooooch!" said Doc Webster, the last rising syllable occasioned by Long-Drink McGonnigle's size nines having come down hard on the Doc's instep. Pretty quick on the uptake, that Long-Drink.

"My name is Hauptman," the fellow said, picking up the drink. "Thomas Hauptman. I'm a . . ." He took a long pull. "That is, I *used* to be a minister."

"And then God went and died and now what the hell do you do, is that it?" asked Long-Drink with genuine sympathy.

"Something like that," Hauptman agreed. "He died of malaria in a stinking little cell in a stinking little town in a stinking little banana republic called Pasala, and his name was Mary." Ice cubes clicked against his teeth.

"Your wife?" asked Callahan after a while.

"Yes. My wife. No one dies of malaria any more, do you know that? I mean, they licked that one years ago."

"How'd it happen?" Doc asked gently, and as Callahan refilled glasses all around, the Time-Traveler told us his story.

Mary and I (he said) had a special game we played between ourselves. Oh, all couples play the same game, I suppose, but we knew we were doing it, and we never cheated.

You see, as many of you are no doubt aware, it is often difficult for a man and woman to agree (sustained audience demonstration, signifying hearty agreement) . . . even a minister and his wife. Almost any given course of action will have two sides: she wants to spend Sunday driving in the country; he wants to spend it watching the football people sell razor blades.

How is the dilemma resolved? Often by histrionics, at ten paces. She will emote feverishly on the joys of a country ride, entering rap-

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ture as she portrays the heart-stopping beauty to be found along 25A at this time of year. He, in turn, will roll his eyes and saw his hands as he attempts to convey through the wholly inadequate vocabulary of word and gesture how crucial this particular game is to both the History of Football and the Scheme of Things.

The winner gets, in lieu of an Oscar, his or her own way.

It's a fairly reasonable system, based on the theory that the pitch of your performance is a function of how important the goal is to you. If you recognize that you're being out-acted, you realize how important this one is to your spouse, and you acquiesce.

The not-cheating comes right there—in not hamming it up just to be the winner (unless, rarely, that's the real issue), and in admitting you've been topped.

That's why when Mary brought God into the argument—a highly unfair, desperate gambit for a minister's wife—I gave in and agreed that we would spend my vacation visiting her sister Corinne.

I had given up a congregation over in Sayville, not very far from here. Frankly, Mary and I had had all the Long Island we could take. We hadn't even any plans: we intended to take a month's vacation, our first in several years, and then decide where to settle next. I wanted to spend the month with friends in Boulder, Colorado, and Mary wanted to visit her sister in a little fly-speck banana republic called Pasala. Corinne was a nurse with the Peace Corps, and they hadn't seen each other for seven or eight years.

As I said, when a minister's wife begins to tell him about missionary zeal, it is time to capitulate. We said good-bye to my successor, Reverend Davis, promised to send a forwarding address as soon as we had one, and pushed off in the spring of 1963.

We divided the voyage between discussing the growing unpleasantness in a place called Vietnam and arguing over whether to ultimately settle on the West or East Coast. We both gave uncertain, shaky performances, and the issue was tabled.

Meeting Corinne for the first time I was terribly struck by the dissimilarity of the two sisters. Where Mary's hair was a rich, almost chocolate brown, Corinne's was a decidedly vivid red. Where Mary's features were round, Corinne's were square, with pronounced cheekbones. Where Mary was small and soft, Corinne was long and lithe. They were both very, very beautiful, but the only quality they shared was a profundity of faith that had nothing to do with heredity, and which went quite as well with Corinne's fiery sense of purpose as with Mary's quiet certainty.

Pasala turned out to be a perfect

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comic-opera Central American country, presided over by a small-time tyrant named De Villega. The hospital where Corinne worked was located directly across the *Plaza de Palacio* from the palace which gave the square its name. De Villega had built himself an immense mausoleum of an imitation castle from which to rule at about the same time that the hospital was built, with much the same sources of funding. Pasala, you see, exports maize, sugar cane, a good deal of mahogany . . . and oil.

As Corinne led us past the palace from the harbor, I commented on the number of heavily-armed *guardias*, in groups of five, each of which had its own *comisario*, who stood at every point of entry to the huge stone structure with their rifles at the ready. Corinne explained that revolution was brewing in the hills to the north, under the leadership of a man named Miranda, who with absurd inevitability styled himself *El Supremo*. Mary and I roared with laughter at this final cliché, and demanded to be shown someone taking a siesta.

Without cracking a smile, Corinne led us around behind the hospital, where four mule-drawn carts were filled with khaki figures taking the siesta that never ends. "You cannot deal with the problems of Central America by changing the channel, Tom," she said soberly, and my horror was replaced by both a wave of guilt and a wistful, palpable vision of Boulder in the spring—which of course only made me feel more guilty.

We dined that night in a miserable excuse for a cafe, but the food was tolerable and the music quite good. Considering that the two women had not seen each other for years, it was not surprising that the conversation flowed freely, and quite a bit of it had to do with *El Supremo*.

"I have heard it said that his cause is just," Corinne told us over coffee, "and I certainly can't argue otherwise. But the hospital is filled with the by-products of his cause, and I'm sick of revolution. It's been worse than ever since De Villega had Miranda's brother shot."

"Good God. How did that come about?" I exclaimed.

"As I said, Pablo Miranda used to run this cafe, and he never had a thing to do with revolution. In fact, an awful lot of militant types used to drink in a much more villainous place on the other side of town, rather than embarrass Pablo with their presence. But after *El Supremo* blew up the armory, De Villega went a little crazy. A squad of *guardias* came in the door and cut Pablo in half.

"Things have been accelerating ever since. People are afraid to go outside at night, and De Villega has his thugs on double shifts. There are rumors that he's bringing in trucks and cannon and a lot of ammunition from the US for an

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expedition to clean out the hills, and the American Embassy is awfully tight-lipped about it."

"How is De Villega as a ruler?" Mary asked.

"Oh, an absolute crook. He robs the *peóns* dry, rakes off all he can, and I'm sure the country would be better off if he'd never been born. But there are conflicting reports about *El Supremo*—some say he's a bit of a butcher himself. And of course he's a Communist, although God knows what that means in Central America these days."

I began a reply, when we heard an ear-splitting crash from outside the cafe. Glasses danced off tables and shattered, and pandemonium broke loose. Three men scrambled to the door to see what had happened; as they reached the doorway a machine-gun spoke, blowing all three back into the cafe. They lay as they fell, and Mary began to scream.

"Tom," Corinne shouted above the din of gunfire and panic-stricken people, "*we've got to get to the hospital.*"

"How do we get out?" I yelled back, rising and lifting Mary from her seat.

"This way."

Corinne led us rapidly through the jabbering crowd to a back exit, at which were gathered a good number of people too frightened to stick their heads out the door. I was inclined to agree with them, but Corinne simply walked out into the night. I glanced at Mary, she returned my gaze serenely, and we followed.

There were no sudden barks of gunfire; the revolutionaries were not really interested in anyone within the cafe—they were simply shooting anything that moved back in the plaza.

As I helped Mary through the dark streets behind Corinne I tried to figure the way back to the hospital, but I could not recall where the back door of the cafe lay in relation to the door through which we had entered. But it seemed to me that we would have to cross the plaza.

I called to Corinne and she halted. As I came up to her a volley of gunfire sounded off to our right, ending in a choking gurgle.

"Considering what you've told us about Miranda's egregious charm," I said as softly as a heaving chest would let me, "hadn't I better get you two women to the American Embassy? It's built like a fort." And it lay on this side of the plaza.

"The hospital is very short-staffed, Tom," was all Corinne replied, with a total absence of facial expression or gesture. But I knew I would never equal a performance like that in a lifetime of trying. As she spun on her heel and continued walking, Mary and I exchanged a long look.

"And she's a rank amateur," I said, shaking my head sadly.

"She and I used to do summer

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stock at home," she said, and we followed Corinne's disappearing footsteps.

Crossing the plaza turned out to be no more difficult than juggling poison darts; the few who shot at us aimed wisely but not well. By the time it was necessary to cross open space, most of the fighting had centralized around the palace itself, and both sides were in general much too busy to waste good bullets on three civilians running in the opposite direction. But as we reached the hospital, I saw over my shoulder trucks pulling around the corner of the building into the plaza, towing cannon behind them. As we raced through white corridors toward the Emergency Room I heard the first reports, then nothing.

The artillery provided by the US State Department got off exactly three shots. At that point, we later learned, a bearded man appeared on the palace balcony, overlooking the carnage in the square, and heaved something down onto the trampled sward. It was De Villega's head. Sensing the political climate with creditable speed, the uniformed cannoneers worked up a ragged cheer, and the Revolution was over.

But not for us. The maimed and wounded who continued to be brought in through the night gave me my first real understanding of the term, *waking nightmare*, and until you have spent a couple of hours collecting random limbs and organs for disposal I will thank you not to use the term yourself. I had rather naïvely assumed that the worst would be over when the fighting stopped, but that turned out to be only the signal for the rape and plundering, which got a good deal uglier. I tried to get Mary to take a few hours of sleep, and she tried to get me to do the same, and although we both put on the performance of a lifetime neither of us would concede defeat.

It was about three-fifteen the next afternoon when I heard the scream. I left one of de Villega's *rurales* to finish sewing up his own arm and sprinted down an overcrowded hall toward the surgery where Mary and Corinne had been for the past thirteen hours. It sounded as though the scream had come from there . . .

It had. As I burst in the door, I saw Mary first, in the impersonally efficient grip of the largest man I've ever seen in my life. Then I saw Corinne, struggling with a broad-backed revolutionary who was throttling a uniformed patient on the operating table. The crossed bandoliers over his shoulders rose and fell as he strangled, as though he wanted there to be more to it then simply clenching his fingers. Corinne he noticed not at all.

She was undoubtedly stronger than I—I wasted no time in pulling at the madman. I picked up the nearest heavy object, a water

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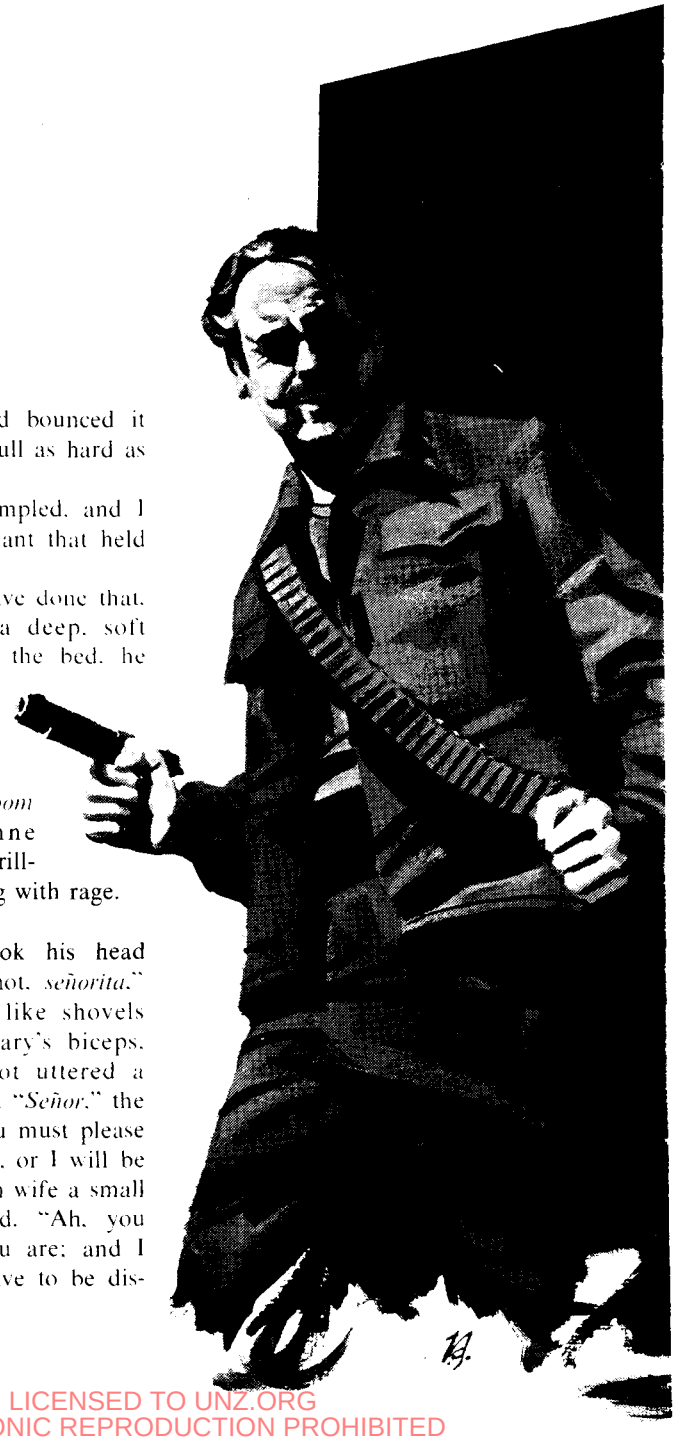
pitcher I believe, and bounced it off the back of his skull as hard as I could.

He sighed and crumpled, and I whirled toward the giant that held my Mary.

"You should not have done that, *señor*," he said in a deep, soft voice. "The man on the bed, he once did a discourtesy to Pedro's wife. A grave discourtesy."

"*Get out of this room at once,*" Corinne snapped in her best drill-sergeant voice, shaking with rage.

The big man shook his head sadly. "I am afraid not, *señorita*," he rumbled. Hands like shovels tightened around Mary's biceps, and she still had not uttered a sound since I burst in. "*Señor*," the giant said to me, "you must please put down that pitcher, or I will be forced to do your own wife a small discourtesy." I started. "Ah, you see? I know who you are; and I would not wish to have to be dis-



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courteous to the wife of a man of God."

The gorilla on the floor began to stir, and the huge man sighed. "I am afraid it is all over for you, *Padre*. Pedro, he is a most unreasonable man when he feels his honor is at stake. You hit him from behind."

Corinne snarled and leaped at him, and I followed suit. Even together we could not budge him or his iron grip, but we kept him too busy to hurt Mary, and I think we might eventually have prevailed. But suddenly something large and heavy smashed into my left kidney, and I fell to the floor gasping with pain. Through the haze I saw Pedro, his tangled hair soaked with blood on the side, step over me and reach for Mary, and my soul died in my chest.

Then my ears rang with a shot, and I twisted about on the floor to see a tall man with a bristling mustache framed in the doorway, a smoking automatic in his hand. He wore the shapeless khakis of the mountains, and there was an easy arrogance in the smile with which he regarded all of us.

Behind me there was a thud as a body hit the floor. Half blind with pain, I contrived to roll over again and saw that the pistol shot had taken off the top of Pedro's skull.

"There is that about martial law," said the man in the doorway with sardonic amusement, "it is addictive."

I finally managed to sit up, bracing myself against a large oxygen bottle. "Who are you?" I managed.

The lean, mustached man bowed low. "Permit me to introduce myself, *Padre*. I am *El Supremo é Ilustrisimo Señor Manuel Concepción de Miranda*, current ruler of this republic. You, in turn, are the Reverend Hauptman, and I must assume that the charming lady there—release her at once, Diego—is your wife Mary."

His excellent English bespoke an unusual degree of education, and his bearing was a studied claim to nobility. I began to believe that we three might survive the afternoon

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for the first time in what seemed like hours.

"How do you all seem to know who we are?" I asked. "We only arrived yesterday, and I don't think we've spoken to more than a handful of Pasalans. Yet that monster over there knew us—and I'm *sure* I'd remember him."

"I know all about the comings and goings of all American nationals in Pasala," he said smugly. "Your country has been a source of much inconvenience to me, and I am a thorough man—as are my lieutenants. Diego is one; Pedro was another. I cannot abide a lieutenant who loses his head." He holstered his gun and entered the room, and I struggled to my feet with Mary's help. We clung together, and she trembled violently.

El Supremo looked about, failed to find a place to sit. He strode to the operating table, shoved the wounded and unconscious soldier off onto the hard floor quite casually, and sat down with his legs dangling over the edge.

Corinne went for him, but before she covered three feet the giant Diego intercepted her and lifted her clear off her feet. She struck at his face with balled fists, but he appeared not to notice. She was sobbing with rage.

"Diego," said *El Supremo* with a grin, "since you do not seem to be content unless you have a women in your hands, why don't you take the young lady to my apartment and keep her there until I come, eh?"

Mary and I both cried out.

"My friends," said Miranda with a grin, "this is only justice. I had a woman, Rosa, and she was the light of my life. She was killed last night, by an American cannon shell. Because of the United States, I have no woman. It seems only fair that America give me a woman. I prefer an unmarried woman, and I do not think the sister of a minister's wife will disappoint me." He laughed, a gay laugh that froze my blood.

"There is that about martial law," I heard myself say, "it is selective."

"Explain," *El Supremo* barked.

"I believe the man on the floor over there was shot for attempted rape," I said quietly.

"*Padre*," said the tall revolutionary, drawing his gun again, "in the absence of a lawful constitution for Pasala, I must do the best I can myself. Occasionally I am inconsistent, as I am now in sentencing you and your wife to ten years' imprisonment for disturbing the peace.

"But you will find that there is *this* about martial law: it is effective."

The next twenty minutes were the last free minutes I would spend for ten years, and the last free minutes of Mary's life, but I don't remember one of them. *El Supremo* marched us at gunpoint across the plaza to the palace, down many

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flights of stairs, to the lowest of the three basement floors which made up the palace's dungeons. Then he locked us into a nine-by-twelve stone cell, and left.

We were there for nine years; and I will not speak of those years. After Mary died, I was there alone for eleven months; and I will not think of those months. I will only say that in the first months, I thanked God for giving Miranda the spark of humanity which caused him to put both Mary and me in the same cell—but soon, as I began to see the subtlety and horror of his true intent, I came to curse him with a black hatred. Ten years inside a stone cube with no heat, no ventilation, and a pail for a toilet can do much to a marriage, and that Mary and I survived as long as we did was, I assure you, due only to the depth and strength of her character. And even she couldn't keep me from losing my faith in God . . .

The minister was silent, staring into his glass as though he read there a strange and terrible secret which he could not quite believe. The stillness was absolute; no flames danced in the fireplace. I caught Doc Webster's eye, and he seemed to come back from somewhere else with a start.

"What happened to Corinne?" he rumbled.

Hauptman put down his glass suddenly, and looked around at us incuriously. "I've been told she died that night," he said conversationally, "and I rather believe it. Miranda was . . . an animal."

"Couldn't the American Embassy do anything to get you out?" asked Long-Drink quickly, and I saw Callahan nod approval.

"The American Embassy," replied Hauptman, "had neither the slightest knowledge of our incarceration, nor the care to know. If anyone at all was aware of our presence in Pasala, he assumed we had been killed in the uprising, and he undoubtedly heaved a great sigh when he realized he had no idea who to send condolences to." His words came like machine-gun bullets now. "We were listed in the prison records as 'Hidalgo, Tomaso and Maria, subversives', and that was quite good enough for the State Department, if they checked it at all. *El Supremo* was quite an embarrassment to the United States, and when they had him assassinated two years later, the puppet *presidentes* they installed were far too busy entertaining American oil executives to be bothered inspecting the palace dungeons. The only human we saw for nine years was a perpetually drunken jailer who brought such of our food as he didn't eat himself. I'd be there now except that when . . . when Mary died, th-they . . ." He broke off, got a fresh grip on himself and continued, "Someone noticed her body being removed for burial, and

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became curious as to why Maria Hidalgo looked like an American. It was a year before I was released, owing to, let me see now, 'political complications of an extremely delicate nature', I think they said, but for the last six months I had Red Cross food and a blanket. Turned out there was a man from Baltimore four cells down, part of the hospital staff, and he was released too, but if Mary hadn't died we'd all still be there together." The minister laughed bitterly, gulped down the rest of his gin-and-gin and made a face. "She was always getting me out of scrapes."

More gin appeared before him; he gulped it noisily.

"You know," he said with a dangerous high note in his voice, "in all that nine years the prayers never stopped rising from that filthy little cell. For the first three years, we prayed that someone would depose *El Supremo*. For approximately the next three years, Mary prayed constantly that my faith in God would return. Then, for about a year, I prayed to I-don't-know-who that Mary would live. And after malaria took her, I spent my time praying to anyone who would listen for a chance to kill *El Supremo* with my own hands.

"I mean to say, isn't it ironic? All that prayer, and none of it did the slightest good. *El Supremo* was dead all the time, I never seemed to get that belief back, and Mary—" He broke off short and began to laugh softly, a laugh that got shriller and shriller until the glass burst in his hand. He just sat and looked at his bleeding palm until Doc Webster came over and gently took it away from him.

"Well, at least this damned thing is disinfected," he grumbled. "Don't ever pull that with an empty glass." Someone fetched his battered black bag, and he began applying a dressing.

Along about that point, everyone in the place got real interested in the floor or the ceiling. It somehow didn't seem as though there was a single intelligent thing that could be said, and it was slowly becoming necessary that somebody say *something*.

Callahan was right there.

"Reverend," he rumbled, hooking a thumb in his belt, "that's a right sad story. I've heard an awful lot of blues, and I can't say I ever heard worse. But what I would like to have explained to me is how, if you follow me, does all this bring you into my joint with a heater in your fist?" There was steel in his voice, and the minister looked up sharply, guilt replacing the agony on his features. *Bravo, Callahan*, I thought.

See, I knew what the preacher couldn't: that when there's anger in Callahan's voice, it's just got to be theatrics, because when Callahan is good and truly pissed off he doesn't bother to talk at all.

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The little minister was a while finding words. "You see," he said finally, as Doc finished bandaging his hand, "it was nine years. Nine *years*. I . . . I don't know if you can understand what I mean. I know it's been two years since Mary died—it's not just that. But you see, she was all I knew for such a long time, and now I don't know anything at all.

"You must understand, in that whole nine years, we never saw a newspaper or a magazine, or a TV broadcast, never heard so much as a radio. We had no communication with the outside world; we were as isolated as two human beings can be."

"Hell," said Tommy Janssen, "that sounds like what I could use to straighten out my head once and for all."

I was thinking about a Sturgeon story called "And Now the News," and I kind of agreed with Tommy, which shows how well I'd read the story.

"Straighten your head out!" Hauptman exploded.

"Now, you know perfectly well what the boy means," Long-Drink interceded. "No one is saying those years weren't nightmares for you, but they were nothing to write home to mother about for us. You missed a lot of turmoil, a lot of bad times and trouble, and maybe in that at least you were better off. I know most of us here have probably wished we could get away from everything for a long spell, and you did it. What's wrong with isolation?"

"Nothing, *per se*," Hauptman said quietly. "The problem is this: the world won't wait for you. You drop out for more than a certain time, and brother, the world goes on without you."

"I think," Callahan said slowly, "I begin to see what you mean."

"You don't even begin," Hauptman said flatly. "You can't. You're too close to it. The whole world turns upside down in nine years, but you turn upside down with it, so that to you it's right-side-up. It all happens over days and weeks and months, and most people can adapt that fast. But I don't recognize the first thing about this world—I didn't live through it.

"Let me give all you good people a history lesson."

He got up, walked to the bar and put out his hand. Callahan put a glass of gin in it. He turned, faced us all, took a long swallow, and cleared his throat pedantically.

"Mary and I left for Pasala in February of 1963," he said. "I've since had occasion to supplement my own memories with references from *The New York Times*, and you may find some of them interesting.

"On the day of our departure, for instance, there had been a total of thirty-three Americans killed in Vietnam since the start of US involvement. Not that anyone knew

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that: it wasn't until a few days after we left that Senator Mansfield's study group issued a warning that the Vietnam struggle was becoming an 'American War, that could not be justified by present US security interests in the area'. Why, the godforsaken place was costing us four hundred million dollars a year, tying up twelve thousand troops!

"Of course, General O'Donnell replied the very next day that all those combat pilots among the 'Advisers' were there to train the Vietnamese, not to take part in the war.

"Lot happened since then, hasn't it?

"Or how about another little sector, my friends? In November of 1962, Dean Munro of Harvard University warned Harvard undergraduates against use of 'the stimulant LSD that depresses the mind', and censured Professors Alpert and Leary for promoting its use. Dr. Leary replied that hysteria could only hamper research, and pointed to the absence of any evidence that the drug was harmful.

"In California, meanwhile, authorities were sounding a warning-note concerning a new drug which was beginning to appear on the streets. It was called Methedrine.

"The New American Church was still fighting unsuccessfully for the right to continue using peyote in its religious ceremonies, a practice which predated white settlement of America. Harry Anslinger had just retired as head of the Federal Narcotics Agency, and there was some talk of banning sale of airplane glue to those under eighteen.

"Incidentally, while Leary and Alpert (who I understand refers to himself as Baba Ram Dass lately) found little difficulty in preserving their academic autonomy, others were not so lucky. Professor Koch was fired from Illinois University for suggesting in print that premarital sexual relations should be condoned. By the time Mary and I got on the boat, the efforts of the American University Professors Association to have him reinstated had been entirely fruitless. A month after we left, the Illinois Supreme Court declined to intervene. The sexual revolution was still being vigorously, and apparently successfully, ignored.

"Hard to remember back ten years, isn't it? How about the space race? The last I heard, we were about a space station and three Moon landings up on the Russians. America has felt pretty cocky about the Big-Deep for quite a while, now. Did you know that by February of 1963, the Russian Vostok series had racked up 130 orbits, a total of 192 hours in space, while the US had a total of 12 orbits and 20 hours? A couple of years earlier, President Kennedy—remember him?—had publicly committed us to a man on the Moon in the next decade, and he was widely pronounced deranged. Eight years

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later, Armstrong took the first lunar walk, and the nation yawned. *Oh, you people are so damned blasé about it all!*

"I could go on for hours. When I dropped out, assassination had not yet become commonplace; JFK was not yet canonized, and RFK was just arguing his first case in any court, as Attorney General of the United States. Cinerama was just getting started, hailed as the wave of the future, and the New York World's Fair had not yet opened. Two months after we left, *Cleopatra* premiered, and Twentieth-Century Fox stock dropped two dollars a share . . ."

Hauptman broke off, began to laugh hysterically. Callahan reached across the bar and gripped his shoulder with a hand like a steak, but the minister shook his head.

"I'm all right," he managed, choking with laughter. "It's just that I haven't told you the funniest joke of all. Nearly killed me at the time, and I didn't dare break up.

"You see, when I was finally released, they brought me directly to Washington, where some very cheerless men wanted to ask me a number of questions and help me memorize what had officially happened. But first they decided to compensate me for my troubles with the thrill of a lifetime. I was conveyed before the President of the United States for a hearty handclasp, and I thought I was going to faint from holding in the laughter.

"I'd forgotten to ask who the President was, you see. Somehow it didn't seem especially important, after all I'd been through, and I didn't expect I'd recognize the name. But when Richard Nixon held out his hand, I thought I'd die.

"You see, three months before I left, Nixon lost the race for governor of California, and assured the press that they wouldn't have Dick Nixon to kick around any more . . ."

This time the whole place broke up, and Doc Webster almost lost his tonsils trying to whoop and swallow at the same time. Fast Eddie tried to swing into "Don't Make Promises You Can't Keep," but he was laughing so hard he couldn't find the keys, and a barrage of glasses hit the fireplace from all around the room.

Which was fine for catharsis, and it lightened the air a little, but as the laughter trailed off we realized that this catharsis was not enough for Tom Hauptman. As his impassioned words sank in it began to dawn on all of us that we had adapted to an awful lot in ten years, and in some crazy way this confrontation with a man who was forced to try and swallow a whole new world in one gulp seemed to drive home to all of us just how imperfectly we *had* adapted, ourselves.

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"You know," Long-Drink said in the sudden silence, "the little man has a point. Been a lot happening lately."

"It occurs to me," Tommy Janssen said softly, "that ten years ago I'd never heard the word *heroin*," and he gulped at his beer.

"Ten years ago," Doc Webster boomed, "I thought heart transplant was the province of science-fiction writers."

"Ten years ago," Slippery Joe breathed wistfully, "I was single."

I was thinking that ten years ago, I wore a crewcut and listened to Jerry Lee Lewis and Fats Domino. "Christ," I said, as the impossible burst over me. "Nobody'd ever heard of the *Beatles* in 1963!" The whole electric sound, the respectability of rock and its permeation of all other forms of pop music, had taken place while Hauptman was rotting in a cell, listening to his fingernails growing. What must the music of today sound like to him? Jim McGinn of the Byrds had pointed out in the late Sixties that the Beatles had signaled a change in the very *sound* of music. He compared pre-Beatles music to the bass roar of a propeller plane, and the ensuing post-Beatles rock to the metallic whine of a jet engine. From what I hear on the radio, it seems that we're already up to the transonic shrieking of a rocket exhaust, and Hauptman was getting it all at once. From Paul Anka to Alice Cooper in one jump! Why, the sartorial and tonsorial changes alone were enough to boggle the mind.

We all stared at him, thinking we understood. But he looked around at us and shook his head, and took another drink.

"No," he said. "You still don't understand. What you are all just beginning to see is what I would, if I were a science-fiction writer, call The Time-Traveler's Dilemma: *future shock*, I believe they're calling it now. But in any case we have The Time-Traveler's Second Dilemma: transplant shock.

"You see, you're all time-travelers, too, traveling through time at a rate of one second per second. In the past few minutes, you've all been made acutely aware of just how much time you've passed through in the last ten years, and it's made you think.

"But I've traveled ten years all at once, and I don't have your advantages. Strange as this particular time is to you, you have roots woven into its fabric, you have a place in it however tenuous, and most important of all, you have a *purpose*.

"Don't you understand? I was a *minister*.

"I was charged with responsibility for the spiritual development of other human beings. I was trained to help them live moral lives, to make right choices in difficult decisions, and to comfort them when they needed comfort. And

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now I don't even begin to grasp their *problems*, let alone the new tools that people like me have been jury-rigging over the past ten years to help them. Why, I went to a fellow cleric for advice, and he offered me a marijuana cigarette! I called an old acquaintance of mine, a Catholic priest, and his wife answered the phone; I told her I had a wrong number and hung up. This whole Watergate Affair is no revelation to anyone who was in Pasala in 1963; it's been a long time since I believed Uncle Sam was a virgin. But I used to be in the minority.

"Gentlemen, how can I function as a minister when I don't even begin to comprehend *a single one* of the moral issues of the day? When I can't, because I haven't lived through the events that gave them birth?"

He finished off his gin, left the glass on the table and began tracing designs in the moisture it had left there.

"I've looked for other work. I've looked for other work for seven months now. Are any of you here out of work?"

Which was a shame, him saying that, because it caused me to pitch a perfectly good glass of Bushmill's into the fireplace.

Hauptman nodded, and turned to the red-haired mountain behind the bar.

"And that, Mr. Callahan," he said quietly, "is the long and short of why you find me in your establishment with a pistol I bought in an alleyway from a young man with more hair than Mary had. I simply didn't know what else to do."

He looked around at all of us.

"And now that didn't work either. So there's only one thing left I can do." He heaved a great sigh, and his shoulders twitched. "I wonder if I'll see Mary again?"

Now, we're a reasonably bright bunch at Callahan's (with some notable exceptions) and nobody in the room figured that the one thing Hauptman had left to do was set up a lawn-mowing service. But at the same time, we're a humane bunch, with a fanatical concern for individual liberty, and so we couldn't do any of the conventional things, like try to talk him out of it, or call the police, or have him fitted for the jacket that's all sleeves. Truth to tell, maybe one or two of us agreed with him that he had no alternative. We were pretty shaken by his story, is all I can say in our defense.

Because we just sat there, and stared at him, and felt helpless, and the silence became a tangible thing that throbbed in your temples and made your eyes sting.

And then Callahan cleared his throat.

"To be or not to be," he declaimed in a voice like a foghorn. "Is that the question?"

Like I said, we're a bright bunch,

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but it took us a second. By the time I got it, Callahan had already lumbered out from behind the bar, swept a pitcher and three glasses to the floor, and wrapped the tablecloth around him like a toga. Doc Webster was grinning openly.

"Listen, ya fathead," said Callahan in the hokey, stentorian tones of a Shakespearean ham, "'tis damn well *nobler* to suffer the slings and arrows of outrageous fortune, than to take arms against a sea of troubles, and by opposing, let 'em lick ya. Nay, screw that . . ." His eyes rolled, his huge hands sawed the air as he postured and orated.

Hauptman stared blankly, his mouth open.

Doc Webster heaved himself up onto a chair, *harummphed* noisily and struck a pose.

"Do not go gentle into that good night," he began passionately.

Suddenly Callahan's Place became a madhouse, something like a theater might be if actors "tuned-up" as cacophonously as do orchestras. Everyone suddenly became the Ghost of Barrymore, or thought he had, and the air filled with praises of life and courage delivered in the most impassioned histrionic manner. I unpacked my old guitar and joined Fast Eddie in a rousing chorus of "Pack Up Your Sorrows," and I guess among us all we made a hell of a racket.

"All right, all right," Callahan bellowed after a few minutes of pandemonium. "I reckon that ought to do, gents. *I* think we took the Oscar."

He turned to Hauptman, and tossed the tablecloth on the floor.

"Well, Reverend," he growled. "Can you top that performance?"

The little minister looked at him for a long spell, and then he began to laugh and laugh. It was a different kind of laugh than we'd heard from him before; it had no ragged edges and no despair in it. It was a full, deep belly-laugh, and instead of grating on our nerves like a knife on piano wire it made us feel warm and proud and relieved. Kind of a tribute to our act.

"Gentlemen," he said finally, still chuckling, "I concede. I've been out-acted fair and square; I wouldn't try to compete with a performance like that."

Then all at once he sobered, and looked at all of us. "I . . . I didn't know people like you existed in this world. I . . . I think that I can make it now. I'll find some kind of work. It's just that . . . well . . . *if somebody else knows how tough it is, then it's all right.*" The corners of his mouth, lifting in a happy smile, met a flood of tears on their way down. "Thank you, my friends. Thank you."

"Any time," said Callahan, and meant it.

And the door banged inevitably open, and we spun around to see a young black kid, chest heaving, framed in the doorway with a .38

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Police Positive in his hand.

"Now everybody be quiet, and nobody gonna get hurt," he said shrilly, and stepped inside.

Callahan seemed to swell around the shoulders, but he didn't move. Everyone was frozen, thinking for the second time that night that *we should have been expecting it*, and of all of us only Hauptman refused to be numbed by shock any more, only Hauptman kept his head, and only Hauptman remembered.

It all happened very quickly then, as it had to happen. Callahan's shotgun was behind the bar, out of reach, and Fast Eddie had been caught with both hands in sight. The minister caught Doc Webster's eye, and they exchanged a meaningful glance across the room that I didn't understand.

And then Doc cleared his throat. "Excuse me, young man," he began, and the black kid turned to tell him to shut up, and behind him Hauptman sprang from his chair headlong across the room and headfirst toward the fireplace.

He landed on his stomach, and his hands plowed straight into the welter of broken glass. As he wrenched over onto his back, his right hand came up and around with that big .45 in it, and the kid was still turning to see what the noise behind him was.

They froze that way for a long moment, Hauptman sprawled in the fireplace, the kid by the bar, and two gun-muzzles stared unblinking across the room at one another. Then Callahan spoke.

"You'll hurt him with a .38, son, but he'll kill you with a .45."

The kid froze, his eyes darting around the room, then flung his gun from him and bolted for the door with a noise like a cross between a sneeze and a sob. Nobody got in his way.

And then Callahan spoke up again. "You see, Tom," he said conversationally, "moral issues never change. Only social ones."

One thing I'll say for the boys at Callahan's: they can keep a straight face. Nobody cracked a smile as Callahan told the cops some hilarious yarn about how the minister had disarmed a thief with a revolver which he had only that afternoon taken from a troubled young parishioner. Some of us had even argued against involving the police at all, on general principles—I was one of them—but Callahan insisted that he didn't want any guns in his joint, and nobody else really wanted them either.

But when I was proudest of the boys was when the police asked for a description of the thief. None of us had given any thought to that, but Doc Webster was right in there, his dragon-in-the-shower voice drowning out all others.

"Description?" he boomed. "Hell, nobody was ever easier to describe. The guy was six-four with

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a hook-nose, blonde hair, blue eyes, a scar from his right ear to his chin and he had one leg."

And not one of us so much as blinked as the cop dutifully wrote that down.

Perhaps that kid would have another chance.

Tom Hauptman, however, didn't come off so well in the aplomb department. As one of the cops was phoning in, Long-Drink called out, "Hey Tom. One thing I don't understand. That cannon you had was in the fireplace for a good hour or so, and that hearth is plenty warm even when the fire's been out a while. How the hell come none of the cartridges went off?"

The minister looked puzzled. "Why, I have no idea. Do you suppose that . . ."

But the second cop was making strangling sounds and waving the .45. At last he found his voice. "You mean you *don't know?*"

We looked at him.

He tossed the gun to Callahan, who one-handed it easily, then suddenly looked startled. He hefted the gun, and his jaw dropped.

"There's no clip in this gun," he said faintly. "The damned thing's unloaded."

And Tom Hauptman fainted dead away.

By the time we had recovered from that one, Callahan had decided that Doc and Noah and I were Punday Night Champions, and we were helping ourselves to just one more free drink with Tom Hauptman when Doc came up with an idea.

"Say, Callahan," he called out. "Don't you think a bunch of savvy galoots like us could find Tom here some kind of job?"

"Well, I'll tell you, Doc," said Callahan, scratching his neck. "I've been givin' that some thought." He regarded the minister with a professional eye. "Tom, do you know anything about tending bar?"

"Huh? Why, yes, I do. I tended bar for a couple of summers before I entered the ministry."

"Well," Callahan drawled, "I ain't getting any younger. This all day and all night stuff is OK for somebody your age, but I'm pushing fifty. Why I hit a man last week, and he got up on me. I've been meaning to get myself a little part-time help, sorta distribute the load a little. And I'd be right honored to have a man of God serve my booze."

A murmur of shock ran through the bar, compounded of shock and awe at the honor being accorded to Tom Hauptman. He looked around, having sense enough to see that it was up to us as much as it was to Callahan.

"Why the hell not?" roared Long-Drink and Doc together, and the minister began to cry.

"Mr. Callahan," he said, "I'd be proud to help you run this bar."

About that point a rousing cheer

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went up, and about two dozen glasses met above the newly-relit blaze in the fireplace. Toasts got proposed all at once, and a firecracker went off somewhere in the back of the room. The minister was lifted onto a couple or three shoulders, and the most godawful alley-cat off-key chorus you ever heard assured him that he was indeed a Jolly Good Fellow.

"This calls for another drink," Callahan bellowed. "What'll it be, Tom?"

"Well," the minister said diffidently, "I've had an awful lot of gin, and I really haven't gotten back into training completely yet. I think I'd better just have a Horse's Ass."

"Reverend," said Callahan, vastly chagrined, "whatever it is, you're gonna get it on the house. 'Cause I never heard of it."

All around the room conversations chopped off in mid-sentence as the news was assimilated. The last time in my memory when Callahan got taken for a drink was in 1968, when some joker in a pork-pie hat asked for a Mother Superior. Turned out to be a martini with a prune in it, and Callahan by God went out and bought a prune.

Hauptman blinked at the commotion he was causing, and finally managed. "Well, it, uh, won't set you back very much. It's just a ginger ale with a cherry in it." He paused, apparently embarrassed, and continued just a shade too diffidently, "You see, they call it that be--"

"*--cause anyone who'd order one is a horse's ass!*" chorused a dozen voices with him, and a shower of peanuts hit him from all over the room. Tommy Janssen heaved a half-full pitcher at the fireplace, and Fast Eddie snatched it out of the air with his right hand as his left picked up "You Said It--Not Me" in F sharp.

Hauptman accepted his drink from Callahan, and he had it to his lips before he noticed the remarkably authentic-looking plastic fly which Callahan had thoughtfully added to the prescription. The explosion was impressive, and I swear ginger ale came out his ears.

"Seemed like a likely place to find a fly," said Callahan loudly, and somehow Fast Eddie managed to heave the pitcher at him without interrupting the song. Callahan fielded it deftly and took a long drink.

"That's what I like to see," he boomed. "A place that's *merry*." ■

Answers to Quiz on page 71.
1-D, 2-J, 3-F, 4-I, 5-H, 6-C, 7-A, 8-E, 9-G, 10-B.

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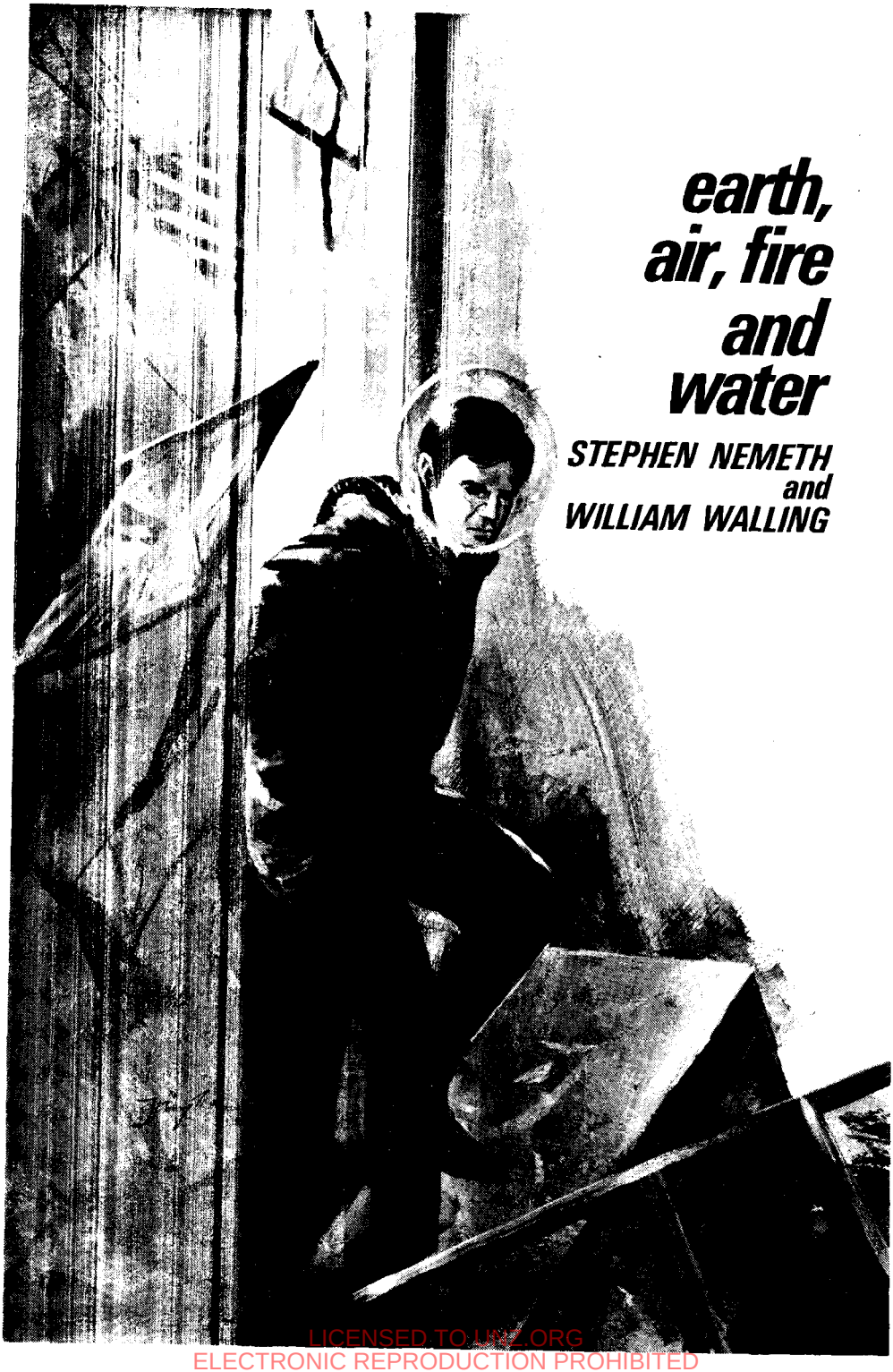

earth, air, fire and water

STEPHEN NEMETH
and
WILLIAM WALLING

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SYNOPSIS

Deeply embroiled in a twofold plot to counter mounting threats of Sino-Sov Communist aggression, billionaire industrialist and US Undersecretary of Transportation ALESSANDRO VOLPONE, *together with two trusted employees—aged financial manager* LEONARD COLO, *and testy physicist* ARNE SEYMOUR—*has gathered around him four powerful and influential co-conspirators: Senator* RAYMOND STILLWORTH, *USAF General* MICHAEL PATT, *CIA Director* ROLFE EMMERSON, *and United TV President* NATHANIAL ABRAMS, *all of whom are by 1988 desperately searching for funds with which to continue . . .*

Project Luft, a century-long scheme to slowly deplete vast quantities of Earth's atmosphere, and Project Lifeboat, a series of forty-one huge subterranean "redoubts" built under cover of DoT's nationwide Interurban Tube Transit System (ITTS), whose computer-operated, magnetically-levitated trains are driven pneumatically through semi-evacuated, subsurface tubes at near-aircraft speeds.

Army Engineer Major LEWIS CRAFT, *accompanied by girlfriend* BETTY DANCER, *attend a party at the mansion of her boss, magazine publisher* HOO HANFORD, *where guest Senator* VICTOR LEWELLYN *displays keen interest in Craft's new assignment—acting as consultant on the Reno-Sacramento ITTS loop abuilding in northern California.*

Later, the senator asks Hoo's and Betty's help in urging Craft to snoop around and discover reasons behind the ITTS Program's inordinate expenditures.

Escorted to the Michigan Bluff construction site by Volpone Industries Superintendent PARKINSON—*in actuality a CIA agent—Craft is surprisingly met by Volpone himself, who shows him "the" National*

Conclusion. The element of surprise is a tremendous advantage in warfare. So is the ability to bluff—and to keep cool under fire.

JACK GAUGHAN

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Redoubt. Stunned, Craft pledges himself to the task.

Home once again in Washington, Volpone and his fellow conspirators discuss their money crisis. Exhausting alternatives, the industrialist asks permission to approach his "friends" for financial aid. Guessing Volpone's "friends" to be Mafiosi, *Stillworth is furious when his adamant opposition is overridden by majority vote. As a result, Don* VITO VICO, capo mafioso *of the most powerful "family" on the Eastern Seaboard, is briefed on both Projects Lifeboat and Luft; Vico, though dumbfounded, promises his support.*

Skiing one weekend with Craft at Squaw Valley, Betty spots an isolated building high atop a snowy summit, which Craft informs her is the A-frame shelter covering the mouth of an ITTS emergency escape elevator. Dropping the girl at the lodge, Craft is approached by a buddy with whom he served in Antarctica, Major RED ARCHER. *Suspecting numerous secret installations, Archer confesses that his own assignment in the Denver-Cheyenne Redoubt is similar to Craft's. Obstinately angry over his friend's casual breach of security, Craft refuses to listen, though the other insists there is "more" to the plot than merely the redoubts.*

Back in the capital, Volpone is enraged over DoT Secretary JERGENSON'S *refusal to endorse legislation vital to the Luft/Lifeboat cause. He condemns the secretary's "Scandinavian stubbornness," thoughtlessly telling Vico of his woes. The Don acts. Jergenson is killed in an auto "accident," and Volpone is appointed Secretary of Transportation shortly thereafter.*

Remorseful over Vico's callousness when next the five convene, Volpone tries to endure Senator Stillworth's needling, but weariness and a frayed temper win out. Engaging the senator in a scathing, no-holds-barred argument, Volpone forces Stillworth to back down by advertising knowledge of his ties with the ultra-right-wing American Rangers. After things cool down, Emmerson warns that many semi-prominent Soviet citizens have inexplicably vanished, inferring that Project Lifeboat has somehow been penetrated, that the USSR is beginning to secrete selected individuals in similar Russian hideaways. But apprehension over possibly impending nuclear war is thrust aside as the evening ends, for Volpone, on a note of heartfelt grief; Leonard Colo has died of a stroke.

Triggered by a vivid dream of nuclear attack, Craft begins to dig for clues in earnest. He slowly gains Parkinson's confidence, then ferrets a number of facts and inferences from the redoubt's "open" microfile. Finally, uneasily convinced of a basis for Archer's loose-tongued revelations, he tries to phone the major's Denver apartment, only to discover that Archer has disappeared. Sensing that his friend has been "put in a bottle" for shooting off his

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mouth, Craft quietly decides not to let a similar fate overtake him.

Grumpy because of Betty's repeated urgings to act as a spy, while on yet another weekend skiing junket, Craft insists on climbing to the summit A-frame ITTS shelter despite snow showers, then baffles Betty by scooping a hole in the snow and burying his skis. Frustrated, Betty is almost in tears.

After a quick trip to Switzerland with his mistress—where he withdrew all his remaining fluid assets—Volpone has an unexpected caller in the person of Vito Vico. The Mafia chieftain is very upset to hear Volpone ask for yet more money, but is persuaded that holding back is now futile. Vico wearily promises to try.

Finally wheedling access to the secret microfile in Parkinson's office, Craft at last strikes gold—irrefutable evidence of forty-one redoubts, plus mind-boggling graphs and drawings depicting Luft's air depletion equipment and timetables. He slips a pair of damning microfilm spools into his coveralls, turning to discover that Parkinson, gun in hand, has been watching him all along.

By distracting him, Craft manages to wrest the weapon away. He bolts despite Parkinson's shouted warning that the marine guards have standing orders to shoot escapees on sight. Running through the redoubt's vast air storage complex, Craft catches a spent slug in the calf of his leg. Eluding immediate pursuit, he drives an electric-powered service tram down the semi-completed ITTS bore toward Reno, eventually reaches the emergency escape elevator, where he retrieves the buried skis and escapes down the mountain by starlight.

Calling Hanford's home from Tahoe City, Craft is delighted to find not only Betty but Senator Lewellyn there. He tells them he intends hiding the microfilm, since he's too hot to carry it. But Hanford insists on rescuing Craft in his personal jet, and is even willing to take him to Washington if his "evidence" warrants it.

Before leaving for the airport, Lewellyn and Hanford debate the most effective way to blow the whistle on Volpone's conspiracy. "Who can we appeal to in Washington?" asks the publisher.

"Senator Raymond Stillworth," answers Lewellyn confidently.

Part 3

XIV

April, 1988

The stock market break came on Thursday, April fourteenth, when the Dow-Jones Industrials plummeted forty-odd points. Fifty-three million shares were traded during the session.

Friday morning President Blair made an unheralded return to the White House from a vital primary campaign junket through the Southeast. The head of the Securities Exchange Commission, and a

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few selected financial advisers, met with him in the Oval Office.

That afternoon Alessandro Volpone learned, via the Cabinet grapevine, what had transpired. In an atmosphere of concern, he made four calls, using the gray audio-only phone he kept locked in his desk, and a small electronic voiceprint comparator with which he verified the identity of each person to whom he spoke. The messages themselves were terse, identical: "Tonight, at midnight."

After repeated accusations of being inattentive, Volpone left Marissa's apartment at eleven-forty, thereby missing Arne Seymour's frantic call by mere minutes. As a result, he failed to learn of Major Craft's defection and escape until returning to his Washington townhouse in the wee morning hours.

He wore a worried frown as he left the elevator and entered the sanctuary, finding all four of his associates awaiting him. "President Blair has decided not to sign the Federal auto license measure," he said, wasting no words on preliminaries. "He will hold it through the grace period, and may decide to invoke the veto."

Volpone sat down heavily. "Blame the financial crisis," he said. "We can't expect the President to jeopardize re-election by signing an unpopular bill into law just now."

"Huh, that's a crusher, Alex." Senator Stillworth heaved his bulk upright, studying Volpone from beneath bushy brows. "Looks like all your work on that damned bill went for nothin', eh?"

Lacking conviction, Volpone held out two faint hopes. "The country's financial climate may undergo abrupt reversal, or the Congress may decide to override the President's veto."

"Sure, sure!" Stillworth snorted in contempt. "We better face up to it; this puts our whole Luft endeavor in deep yogurt."

"I called the meeting to discuss contingency plans," said Volpone.

"Such as?" demanded the senator rudely.

Volpone reined his temper, determined not to let Stillworth anger him tonight. "That's what we're here to discuss, Ray. Failing other sources of revenue, we must live through a hiatus in Luft construction until the financial squeeze lessens."

"You were dead set against that last time," objected General Patt. "It will wreck our Luft timetable completely."

"True," admitted Volpone, "but we're faced with a *genuine* economic emergency, General. I see no other way out."

Patt was rankled. "Alex," he said heatedly, "we've spent billions of stolen tax dollars in order to *deal* with emergencies. The time has come, I think, to move large numbers of people underground."

"Into the redoubts?" Volpone

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was puzzled. "Why now, General?"

"Why? Pretty damned elementary, isn't it? Ignoring Luft's air depletion timetable for the moment," said Patt, "I contend that significant numbers of citizens should be brought into the redoubts nationwide—a cadre of residents, not transients, who'll establish the routines of daily life."

"Now?" asked Abrams. "For what purpose, General?"

Patt regarded the TV executive coldly. "I believe we should prepare for the worst, Mr. Abrams. Call it instinct, if you wish. I have a gut feeling, based on a combination of small indicators, that things are about to go pop.

"Take the grain shortage in the Soviet Union, for example. It doesn't ring true: their bumper crop of last fall seems to have been stockpiled rather than consumed. Or the disappearing Russians Dr. Emmerson reported on last time we met, or keeping track of Soviet Ambassador Kirilov. That's gotten to be rather a chore: he's been flitting back and forth from Washington to Moscow like a starling these past months. Plus military data I'm not at liberty to divulge even to you gentlemen."

"An' you suspicion some overt move by the Reds is in the offin', eh?" Stillworth sniffed, then blew his ample nose with gusto. "Wouldn't surprise me none if you were right, General."

"You could call it intuition," granted Patt. "But I do have that feeling."

Volpone, who had listened attentively, sat forward. "Forgive me for disagreeing with you, General, but mightn't it be an error to staff the redoubts now? If no war appears for ten, fifteen years, think of the consumables they'll use: food, power, air—"

"*If* we are allowed ten or fifteen years," was Patt's rejoinder.

"But . . . yes, I concede that things might not hold together much longer," said Volpone. "Nevertheless, we're reasonably well prepared; an attack alert will instantly warn three-quarters of a million people. They've been briefed on what assembly points they're to meet at, know as much as we can allow them to know about saving themselves."

General Patt's headshake was adamantly negative. "The false security of the past, Alex. You're thinking in terms of a fifteen- to forty-minute warning. This is 1988; a preemptive time-on-target strike by combined Sino-Sov orbital, aerial and undersea forces would barely give us time to mount a counterstrike, let alone hustle that many people safely underground."

"I . . . it would appear that we'll have to change our thinking." Volpone paused, realizing he sounded confused. "What you've said bears careful thought, General. Shall we make it an action item on the next agenda to discuss streamlining—"

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"That's a cagey way of putting me off, Alex," remarked Patt, smiling without humor. "But I meant what I said: we must establish a permanent cadre of redoubt personnel—now!"

"Dammit, that ain't enough, neither," objected Stillworth. "Seems to me we gotta *use* the advantage we've earned with the air depletion shenanigan. Goose 'em; force 'em t'show their hand."

"Pick our spot, our own time and place to start the fight?"

"Right, General. It's been thought of more'n once," said the senator, looking sly. "I venture to say you War College boys have included similar postulates in your situation games, not so?"

Patt looked bemused as Volpone hurried to say, "Then *we* would become the aggressors, Ray."

"So let's become the most aggressive goddam aggressors in all history," advocated Stillworth. "It's not 'American', you'll say. *I* say this time it is. If we don't have the stomach for it, we're gonna pay the penalty, be owned property someday. An' there won't be such a thing as the 'American' way on the face of the globe."

In a restrained voice, Volpone said, "Ray, you're not addressing an audience of American Rangers now. I'd like to redirect our discussion toward concrete, practical suggestions as to—"

"Concrete an' practical, is it?" Stillworth's chin lifted; his bloodshot eyes lighted with challenge. "OK, try this for size: that ol' boy who works for you, Arne Seymour, was doin' some talkin' the weekend me an' Nat spent out t'your place on Long Island, oh eight, maybe ten years ago. He got liquored up an' fired off the damnedest spiel I ever heard, sayin' we weren't doin' near everythin' we could to hurry the air depletion scheme along.

"Seymour talked about *addin'* in every possible way to social chaos an' environmental pollution. Poison the oxygen producin' plankton in the seas, he told us; deforest the wilderness areas; abolish the commercial waste an' atmosphere emission standards we got now; cut out all foreign aid an' welfare programs. Make 'em so miserable an' sick of livin' they'll work their tails off suckin' air down into the Earth, an' go gladly to live there themselves till the swarms of heathen Communists die off."

Alessandro Volpone was aghast. "You're joking, Ray."

"Jokin' hell! Seymour's *your* boy, Alex. To perdition with fresh air an' clean livin'; what's that got us? Why, we've gone about this whole Luft thing arsey-versey. Progeny taxation an' stable population programs my Great Aunt Nell! Wipe out all that namby-pamby crap, I say. Let 'em breed; the more folks there are, the more misery there'll be. An' that, my idealistic colleagues, is exactly what we need an' are gonna get!"

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A violent argument erupted. Volpone found the senator's accusations oddly indefensible; being charged with adhering too closely to traditional American ideals did not, after all, constitute a slanderous indictment.

Volpone in turn raised the strong point that, moral considerations aside, doing as Stillworth suggested was positively unthinkable. It was their goal to sustain, not escalate, the air depletion effort; to wait out the other side, hang tough and scrape up the required funds somehow. He stressed the fact that their advantage grew with every passing hour, sensing with a sinking feeling that his co-conspirators seemed to have heard that argument once too often.

General Patt was bestride the fence, seemingly favoring Volpone's tack on general moral principles, but not by any significant margin. Emmerson listened in stoic silence; the light reflected from his glasses and veiled his eyes, lending him a vaguely sinister appearance.

"What are we?" demanded Volpone, pulling out all stops. "Are we poisoners, murderers? Isn't it enough that we've provided a refuge for many of our citizens, given them an insurmountable advantage over the Sino-Sov Coalition?"

"No, dammit, it ain't!" bellowed Stillworth. "*You* called tonight's meetin', Alex, 'cause our backs are agin' the wall. We've got one foot caught in a bear trap, an' the hounds are closin' in. We have to get hard-nosed, *practical*, an' carry Seymour's thesis to its ultimate conclusion: store all the goddam air we can get hold of, sure, but at the same time *use* the club it's cost us so much time an' money to build."

General Patt surprised and dismayed Volpone by saying, "It makes sense. But only if we staff the redoubts immediately."

"Surely, surely; we'll start marchin' 'em underground soon as we can set up the machinery," agreed Stillworth. "Let's stop buildin' compressors an' tanks for the time bein', save the capital, an' commission Seymour to dream up a detailed plan for screwin' up the atmosphere an' hydrosphere as much as possible, as quickly as possible. By God, I'm askin' for a vote on that."

"But, Ray—"

"No, y'cain't hedge this time, Volpone. I'm makin' it a formal request." Stillworth leered in red-faced triumph.

Volpone searched one grim face after another. "Very well."

As usual, Stillworth and Abrams voted in unison. Volpone thought he could count on Emmerson's far-sighted cooperation, while a quick ballot might tip the general's vote his way. "A show of hands, please; all in favor of adopting the senator's resolution?"

Alex Volpone's scalp prickled; he cringed inside himself. Four hands

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were raised against him around the table.

"Record the vote," snapped Stillworth, rising with a self-satisfied grin of victory. "Now maybe we'll begin to get somewhere with this crazy air stealin'. Any other business tonight?"

Volpone shook his head glumly.

"Good. Then I'll see y'all." Senator Stillworth and Nat Abrams broke a hard-and-fast rule, leaving together arm-in-arm.

General Patt waited the prescribed interval, then paused beside Volpone's chair. "It wasn't easy to vote you down, Alex."

Volpone mumbled something about wondering if they'd reached the proper decision. The general left, his face blank.

The CIA Director sipped his coffee, regarding Volpone over the rim of his cup with an air of patient deliberation. "I realize how disappointed you must feel," he said. "It wasn't an easy decision for me either." Emmerson put his cup down sadly. "Alex, altruism won't solve our dilemma," he observed. "Nobility, high ideals, energy and perseverance; those are your major attributes. I admire you, respect your integrity, your strength of purpose. You've held this thing of ours together by sheer force of will.

"Ray Stillworth is a creature of the political jungle; a gut-slashing, Red-baiting, dirty fighting son-of-a-bitch. But we're about to engage in a fight for survival, if what Patt suspects is true, not a championship match with Marquis of Queensbury rules. His way might—just might—give us the edge we need to win."

"Come off it, Rolfe," scoffed Volpone. "You don't believe in the general's intuitive powers any more than I do."

"Perhaps not," said Emmerson. "But, Alex, I *do* believe it's impossible to hold things together here at home while our grandiose Luft Project matures. We're predicating depletion of ten percent of the Earth's atmosphere by the year 2070. Think about the nation's political plight, its socioeconomic climate. Can we expect the revolutionary radicals, disenfranchised senior citizens, various minority blocs, or the fifteen percent of our citizenry taxation has forced to live on welfare, to spend a century waiting for something they have no knowledge of to ripen?

"I'm ignoring another fact of life," continued Emmerson. "Neither Lifeboat, nor Luft can be hidden forever. This nation's half filled with blabbermouths; the other half are newshounds. Someone's bound to blow the cover story in time. But how much time? Ten decades? That's unreasonable. For all we know, Sino-Sov agents penetrated Luft and Lifeboat years ago. Both are too large, too inordinately expensive to hide much longer."

Alex Volpone wearily rubbed his

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eyes. "Rolfe, I'm much too tired to defend my position tonight. I'm sorry."

Emmerson donned his hat and coat, unplugging the coffeemaker with paternal care. "Call me next week, Alex. We'll have lunch."

"I will. Good night." Volpone set the destruct mechanism on the heavy file-safe, switched off the lights and left the sanctuary.

Reaching home, he learned of Major Craft's extraordinary feat of derring-do in eluding pursuit with damning evidence of the entire Luft and Lifeboat Projects. Alessandro Volpone found that for some strange reason he didn't even care.

XV

April, 1988

Twenty minutes out of Washington, DC, Hoo Hanford's sleek jet whispered through the night sky, flying toward a gray wash of light along the eastern horizon which heralded the coming sun.

Virginia Lewellyn dozed. Across the cabin on the other lounge, Betty held Lew Craft's head cradled in her lap, while Hoo and the senator huddled in front of a portable microfilm viewer.

Lewellyn massaged the back of his neck. "Damned if I believe it," he said, "*any* of it." It was a phrase he'd used often since the publisher's jet had plucked Craft from the darkness-shrouded taxi strip at Lake Tahoe's airport.

"There's a milestone chart and graph that're both eye-openers," remarked Craft, yawning. After becoming airborne, Virginia Lewellyn had washed out his gunshot wound, dusted it with sulfa powder from the plane's first aid kit, and bandaged the leg with semi-professional skill. As a result, Craft felt much better.

"The *magnitude* of this air storage caper is what gets you." Hoo Hanford chewed his pipe's nylon bit. "Volpone must be deeply involved; the drawings and specs have his company's name all over them. But he couldn't have swung this alone."

"Hell, no! A consortium of the wealthiest men on Earth couldn't have done it." Lewellyn rubbed the crick in his neck again. "Where-oh-where did they ever find that much *money*? Robbing ITTS appropriations blind wouldn't scratch the surface of their needs."

"You're both beginning to believe it," said Craft.

Senator Lewellyn sighed. "I do . . . reluctantly. If you'd blown the whistle without showing us these documents—"

"You'd have had me sewn into a white jacket with funny sleeves."

"Not to mention the forty redoubts," put in Hanford.

"Forty-one," corrected Craft. "The Sacto-Reno complex will be ready for occupancy in three or four months."

The senator grunted. "One thing

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bothers me. Hoo and I have listened to your pitch, looked over this material—what we could understand of it, since neither of us is technical-minded—but how can it be proved?"

"People will take Lew's word for it," insisted Betty.

Lewellyn chuckled. "Some may be harder to convince than that," he said. "Seriously, Craft, do you know of any demonstrable, physical evidence we can use to support the documents?"

Craft raised his head, looking thoughtful. "Aside from raiding the installations themselves, or forcing whoever's responsible to own up, I can't . . . Hey, how about malaise?"

"Malaise?" Lewellyn's expression was quizzical.

"About four months ago," said Craft, "when I first came back from Antarctica, there were stories of Peruvian Indios, and Sherpas and other Tibetans living in the High Himalayan plateau, who'd been migrating down into lower valleys in droves, complaining of anoxia symptoms, the inability to lead climbers to the higher slopes during expeditions."

"Not exactly dynamic proof," said Hanford. "The malaise phenomenon created quite a stir, then the topic faded away."

"Sure," said Craft, "after every person living in Alta Himalaya, or the Altiplano, moved down toward sea level—or died."

"That's horrible!" Betty shuddered. "It's . . . murder. Why would anyone want to do a dreadful thing like that?"

Senator Lewellyn looked inquiringly at Hanford. "Now there's a question no one's bothered to ask, old-timer. What spurred the crew of ghouls who are responsible for this nightmare?"

"I can't imagine." Hanford frowned. "Any notion, Craft?"

Lew Craft's lips pursed in speculation. "I haven't had much chance to think about it. To me, it hints of international blackmail, though the government seems ignorant of what's happening."

"Geopolitical blackmail, eh? An interesting theory," said Lewellyn. "There may be some kind of skewed logic behind that. Well, sooner or later we'll find out. Let's all go rest up at Ginny's and my place in Maryland. I won't be able to contact Senator Stillworth until later in the day."

Craft deliberated with himself. "Mind if I stop off at the Pentagon, Senator? If I don't report in, they'll charge me with all sorts of nasty stuff."

Lewellyn's eyes narrowed. "What if your superiors fail to give you a thorough hearing? They'll have you behind bars—"

"Or tending shadows in a funny farm," guessed Craft.

Lewellyn smiled. "A distinct possibility. My point is, we need your testimony to brief Stillworth. He's

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got to be one hundred percent convinced we're not chasing rainbows."

Craft looked unsure. "OK, it's your show now, Senator."

The plane's intercom came alive. "Letting down toward Washington National, Mr. Hanford," announced the pilot. "It's forty-one degrees and hazy in the city. I suggest everyone fasten his seatbelt."

"Where shall I tell the crew to let us deplane?" asked Hoo.

"Hm-m-m, let's see; be wise to stay as far as possible from the passenger complex," said Lewellyn, thinking out loud. "Have us assigned a parking spot, then send one of the pilots to call a cab. We'll get right over to Maryland; our apartment in Kensington is only thirty minutes from the airport."

Glowing with crusader's fire, Senate Majority Leader Raymond Stillworth emerged from his private quarters in the Senate Office Building. "Ah! These our friends, Vic?" he asked rhetorically. "Come in; come right on in, ladies an' gentlemen." Listening closely to Senator Lewellyn's introductions, he was the picture of Southern courtliness with Betty, and with Virginia Lewellyn, whom he'd never before met, then shook publisher Hoo Hanford's hand, exhibiting all of the charm and dignity he reserved for equals.

Finally he turned to Lew Craft, appraising the major's blood-stained dungarees with heavy-lidded skepticism. "Major Craft," he said solemnly, "if the very startlin' facts Vic has just laid before me prove true, America owes you a tremendous debt of gratitude."

"Thank you, Senator," said Craft. "They're all true."

Stillworth raised pudgy hands, palms outward. "Don't misinterpret my meanin', son; I haven't a single misgivin' about your intentions, your integrity, or the veracity of your story. But, to quote an adage from a neighborin' state, 'Show me!' "

"I intend to. The microfilm spools are right here." Craft patted the pockets of his dungarees.

"Good, good. Hang onto 'em for a few minutes, though. I made a couple of calls. Rolfe Emmerson an' the chairman of the Joint Chiefs of Staff are on their way over here, loaded with questions."

"Emmerson?" Lewellyn's tone was questioning. "Would CIA be interested in a purely domestic problem, Ray?"

"Ordinarily, no," said Stillworth glibly. "But we've no assurance it *is* strictly a domestic affair, have we, Vic? Besides, Emmerson was handed the thankless job of gettin' to the bottom of the ITTS money puzzle after the Justice Department an' FBI both flunked out."

"I . . . see."

"Sit down; make yourselves comfortable," urged the elder senator as the intercom buzzed softly.

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"'Scuse me, folks. Yeah, Minnie?"

"A call for you, Senator. Line four."

"Thought I asked you t'hold all calls, Minnie, dear."

"It's Dr. Emmerson. He insisted on speaking to you."

"Oh, I see. All right." Stillworth picked up the old-fashioned handset. "Rolfe, you there?" There was a lengthy pause. "Is that right? He does?" Another silence. "Well, that may be kinda premature, don't you think?" Stillworth listened attentively. "I guess so; he's the boss. OK, see you in about an hour."

Stillworth caged the phone, waxing his hands. "Listen here; Dr. Emmerson just spoke to the President. I personally think we're runnin' off to do we-know-not-what, but President Blair wants all of you an' that microfilm safely beyond reach of whoever may be perpetratin' this conspiracy. General Patt, Dr. Emmerson, an' a passel of Secret Servicemen are gonna meet us in the–" Stillworth broke off, looking cagey. "Aw, what's the matter with me! You folks know more'n me about the redoubts."

Lew Craft looked troubled. "We're going to a nearby redoubt?"

"Correct. The Washington-Baltimore Redoubt; the twin of the one out'n California. Patt's havin' a closed van sent over, along with an armed escort. We cain't let you be seen. Not till the microfilm's safe, an' we have everythin' we need to corral some people for questionin'.

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Pardon me one second; I want to tell my secretary somethin'." The senator bustled into the anteroom.

Craft stepped close beside Lewellyn. "Senator, that phone call; I couldn't hear anything at the other end," he said quietly.

Lewellyn looked at him askance. "What did you say?"

"I didn't hear a voice-buzz from the earpiece," insisted Craft. I was sitting next to Senator Stillworth's desk, remember? I think he was talking into a dead phone, like an actor."

"Sure you're not imagining that?" Lewellyn was mystified.

"What is it?" inquired Hanford.

"Craft thinks—" Senator Lewellyn broke off as Stillworth reentered his office. "I expect we can go now, folks," the portly Southerner announced. "The van's waitin' down in the garage."

"Fine," said Lewellyn unsurely, darting a glance at Craft.

"Before we go, is there a men's room handy?" asked the major.

"In there." Stillworth pointed to a door across the office.

"Me too, I guess." Senator Lewellyn followed Craft. He shut the door, whispering, "Do you realize what you're suggesting?"

Craft hesitated. "Yes, but my alarm circuits are jangling, Senator. Didn't it strike you as damned peculiar how easily he bought the whole goofy story? I read Stillworth as a wary, hard-headed old coot who wouldn't let the Pope direct him to Saint Peter's without checking a roadmap, yet he hasn't even *looked* at the microfilm."

"Hm-m-m." Lewellyn scowled. "Now that you mention it—"

"He went ahead," whispered Craft, "and called in some big wheels just on your say-so, without even making sure of what we had."

Lewellyn puffed his cheeks, looking harried. "What can we do?"

"Take this." Craft held out one of the microfilm spools. "First chance I get, I'm going to bug out with the other and head straight for the Pentagon. If I'm wrong, no harm done."

"You've managed to alarm me," said Lewellyn, swallowing uncomfortably. "Do it, Craft. I hardly believe he's implicated, but your way is safer. Let's get back to the others."

Betty, and Virginia Lewellyn, were chatting with Stillworth's secretary, while Hoo and the impatient senator stood at the door.

Craft started visibly when he saw armed marines waiting in the corridor near the elevator. "You're jumpy, Lew." Betty took his arm.

"It's nothing." Craft eyed the corridor. There was no way out; not up here on the third floor. He decided to bide his time until . . . until when?

The marines rode down with them to garage level, while Craft's mind spun furiously. With a game leg, he wouldn't be able to run for it this time. He had to stall, some-

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how. He made his limp more pronounced. He and Betty fell slightly behind the others.

"That laig actin' up?" asked Stillworth, stopping. "Stiffness is probably settin' in, huh?"

"It's beginning to hurt," said Craft. "Could we stop at a hospital somewhere and have a medic look at it?"

"Good idea," endorsed Stillworth. "Better yet, we'll have a GI doctor fix you up when we get down below. Howzzat?"

Craft exchanged grim-faced glances with Lewellyn as Stillworth ushered them toward the rear of the vehicle, then looked longingly at the square of daylight far down the length of the garage. A marine helped him climb aboard the van; Craft could think of no alternative to climbing in, other than perhaps getting shot again.

The van's doors closed with dual clumps of finality.

Being unable to see outside made it worse, somehow. The van's occupants seemed very subdued. Stillworth pronounced repeated sympathy for how tired they must be, saying there would be plenty of opportunity for rest after they'd been assigned quarters in the redoubt, which chilled Craft to the core.

After half an hour, the van stopped, turned sharply, and backed for what Craft judged must be several dozen yards. He steeled himself, preparing to seize whatever presented itself in the way of an opportunity for escape.

There was no opportunity. The double doors were opened from without; they exited onto a loading dock inside a vast sheet metal building where a squad of marines lined the concrete apron leading to a set of immense, steel-sheathed doors Craft immediately recognized. The doors rumbled open five feet, and stopped. The enormous bucket used for lifting fused and pulverized rock had been dismantled and, doubtless, shipped to yet another incipient redoubt site, having been replaced by a large platform.

Craft hung back, clinging to Betty like a crutch, while Stillworth led the rest of the party into the elevator.

"What's the matter, Lew?" asked Betty. "Does it bother you?"

"Just feeling a little wobbly," he said, freezing in the doorway. Last chance! If he crossed the threshold, it meant being put back in the bottle. But armed marines were beside him, waiting.

"Give you a hand, sir?" A lance corporal took his elbow. Without seeming to resist, Craft planted his feet in a fixed stance.

Senator Stillworth called, "How ya keepin', son? Not so good?"

Tugging loose from the marine, Craft moved to lean against the steel wall formed by the elevator door. "I'm woozy," he muttered,

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taking a tentative step away from the elevator.

Stillworth stepped out, his florid features showing concern. "We'll take care of you; don't fret." He motioned to the marine beside Craft with a scalloping movement of one pudgy hand.

Three other marines aided the first. They lifted Major Craft bodily and carried him into the elevator, depositing him next to the handrail, then held him erect.

"Hang on, folks," advised Stillworth. "The first step's a honey!"

Fuming inwardly, Craft heard Betty and the others gasp as the floor dropped from under them with startling swiftness.

"Gosh, it's worse than a roller coaster," exclaimed Betty.

Craft did not answer. He was standing, knuckles white on the handrail, trying to quell the urge to swear and smash things.

They got off at C Level, and Craft's hopes dissolved entirely. The squad of marines who had accompanied them in the elevator was met by what seemed a whole platoon. Craft again crossed glances with Senator Lewellyn, exchanging visual shrugs.

"This way, ladies an' gentlemen." Stillworth led them onto a slideway running down the center of C Level's main concourse.

"It's so big!" Virginia Lewellyn said excitedly. The concourse stretched ahead of them, diminishing to a single point, the startling perspective accentuated by smooth, severe walls, floor, and ceiling. Only a few persons were visible in the vast expanse.

The marines showed them where to step off the slideway. They passed through an arched alcove into a wing which Craft inferred, from knowledge of the Sacto-Reno Redoubt, to be largely living quarters, marching past a guard point, down a secondary branch corridor, and halting in a vestibule of some sort containing lounges, chairs, and dozens of potted plants.

Senator Stillworth hung back, regarding them with hooded eyes. "Someone'll be along directly to show you your quarters," he remarked in a cynical voice. "Make yourselves t'home."

"Where are General Patt and Dr. Emmerson?" asked Lewellyn.

Stillworth said nothing.

"Er, how long will we be staying?" inquired Hanford. "I should be back in Los Angeles on Tuesday at the latest, Senator."

Raymond Stillworth leered at them, barking a short laugh. He turned on his heel and waddled from the chamber without looking back. The marines filed out after him, standing on either side of the entrance until the doors slid shut with a disheartening thud.

"What the . . .!" Hanford stared blankly at the others.

"We're in the bottle!" Craft

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seethed with helpless fury. "They just drove home the cork."

"Bottle? What do you mean, Lew?" asked Betty, worried without understanding why.

Lewellyn grasped at straws. "We still . . . have the microfilm."

"We have it, all right!" Craft's sarcasm was scathing. "The trick will be to find someone who'll bother *looking* at it."

"I . . . I'm sorry, Craft." Lewellyn looked devastated. "It's my fault—all my fault."

"What is, dear?" asked his wife.

Senator Lewellyn sagged into a lounge. "I blew it," he said in a defeated voice. "Boy oh boy; I really blew it!"

"Will one of you *please* tell me what the hell's going on?" demanded Hanford.

Craft told him, choosing his words with care, in a few biting sentences. When he had finished, he drew Betty down beside him on the lounge opposite Lewellyn, and put his arm around her.

Virginia Lewellyn sank slowly beside her husband, while Hanford stared at Craft open-mouthed. "My God!" said the publisher. "How long can they keep us here?"

Craft shrugged. "I don't know whether it's a killing bottle, or just . . . The best we can hope for is the rest of our lives, I guess."

A door opened somewhere behind them. A tall, red-haired man wearing a gray jumpsuit stepped into the vestibule, regarding them silently. "Hello, Cobber," he called.

Lew Craft came to his feet in one motion. "Red!"

"Wish I could say I'm glad to see you here, Lew." Major Archer studied his friend, shaking his head. "But I'm not."

"The rest of our . . . lives," said publisher Hoo Hanford in a dazed voice.

XVI

May, 1988

Alessandro Volpone's manservant disturbed his master's restless slumber by gently shaking his shoulder. "An urgent call, sir, from someone whose name is on the list—a Dr. Emmerson."

"Thank you. I'll take it here." Groggy, Volpone waited until the valet left the bedroom, glancing at the bedside clock's illuminated dial face. It was a quarter to three. He lifted the old-fashioned French telephone, a valuable antique, "Yes, Rolfe?"

"At once, Alex. The condition is red."

Alex Volpone sat bolt upright in bed. "Have I time to run over to Glover Park?" he asked, thinking of Marissa.

"No," came Emmerson's cold, flat denial. "Minutes count." With a barely audible click, the line went dead.

Volpone bounded about, drawing on a pullover and slacks. He grabbed a topcoat, a hat, and the suitcase he'd kept fully packed for

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almost fifteen years. Another like it reposed in his bedroom at Foxhaven; a third was in Marissa's apartment.

Minutes after receiving Emmerson's call, he backed an electric runabout from the garage. A few cruising taxis and cars carrying night people disputed his exclusive use of downtown Washington's streets. Pulling up to the Mall ITTS entrance, he disregarded the red curb, snatched the suitcase from the passenger's seat, and hurried across the sidewalk, pausing to glance at the sky.

Flinty stars winked in the clear, moonless night. He studied the softly lighted Capitol dome, the Washington Monument's illuminated spear, wondering if he would ever again know the sweet sights and sounds and smells of the upper world.

Thrusting aside a twinge of conscience at being forced to abandon Marissa to her fate, he pushed his way into the deserted ITTS station, emerging minutes later more than a mile beneath Laurel, Maryland.

Stillworth and Emmerson were waiting when Volpone let himself into the sanctuary. "Fill me in," he requested brusquely.

Arms folded, Emmerson had been pacing the cramped, rockwalled chamber, deep in thought. "Alex, the signs are ominous. Yesterday morning Ambassador Kirilov returned to the Sino-Sov embassy from his fifteenth visit home in as many months. Our people inside Russia have reported numerous, conspicuous absences during the past week or ten days—Premier Balinin, the entire Presidium, Politburo, et cetera. Late yesterday, all leaves are canceled for Red Army and Navy personnel."

"Tell him about the goddam pill," urged Stillworth sourly.

Rolfe Emmerson searched the industrialist's face. "Alex, it's frightening in implication; within a single twenty-four-hour period, every man, woman and child within the USSR's awesome boundaries seems to have been administered some sort of pill."

"Pill? What kind of pill?"

The CIA Director shook his head. "We don't know. Medics dispensed them; people were forced to take them on the spot—including some of our agents—precluding the opportunity for thieving a sample and having it analyzed."

Volpone's eyes narrowed. "My first impression," he said slowly, "is that our Russian friends have developed some medication which counteracts, or palliates, the effects of radioactivity."

Emmerson seemed doubtful. "Possible, but not likely, according to Dr. Hershkowitz. It seems radiation's too basic, Alex; it first attacks the least specialized body tissue—the intestinal lining—then progressively destroys more and more complex tissue."

Numbly, Volpone removed his

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topcoat. "We'll have to discover what the pills are for, then. Where are Abrams and Patt?"

"General Patt has established a command center in M Level," Emmerson told him. "Strategic Air Command is standing to yellow alert, in readiness for an all-out counterstrike."

"And Abrams?" Volpone cast a questioning glance Stillworth's way.

"I dunno, Alex," said the senator. "Rolfe tried three times to contact him. I called twice myself from up in the redoubt. Maybe Nat's latched onto some new galfriend. Who knows?"

Volpone said, "I hope it doesn't cost him his life. I'm going up to M Level and make some calls. There's a lady I'd very much like to have escorted into the redoubt. Do you think there's time?"

Emmerson wasn't sure. "We've nothing upon which to base an opinion, as yet. Go ahead; it's worth a try. In fact, why don't we all adjourn to M Level? The sanctuary may be a shade safer, but it's damned inconvenient being cut off from everything like this."

The ensuing day, Thursday, May fifth, was passed in what might be termed a fingernail-chewing state, punctuated by four-way debates as to whether or not a call-in of redoubt candidates should be implemented as a crash priority. It was General Patt, surprisingly, who offered the strongest argument for holding off, insisting that fully-staffed redoubts had never been his intention; that a premature alarm would cause much more damage in the long run than a last-minute panic call-in. But the slow process of bringing hundreds of permanent residents underground was increased fivefold as a precautionary measure.

Volpone managed to get through to Marissa—who had the maddening habit of turning off her phone upon retiring—at one o'clock that afternoon, defying Rolfe Emmerson's dire warning by going up himself to fetch her into the redoubt. Shocked and disenchanted by the utilitarian living quarters assigned her, Marissa stamped her dainty foot and wanted to leave. Volpone cut her protests short by locking her in.

The four men met shortly before sundown topside, deciding—over Emmerson's strenuous objections—that if no overt move was forthcoming by Sino-Sov Coalition forces within forty-eight hours, they would scrub the operation, return to normal life, and await developments.

The CIA Director, certain in his own mind that some form of BW attack was imminent, was patently unhappy with suggestions for quitting the redoubt before adequate reasons for the USSR's dispensation of mysterious pills were discovered. Feelers had been put out to hospitals and clinics across

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the nation with, thus far, negative results.

They were relaxing, watching a satellite-relayed *Cinco de Mayo* celebration in Mexico City over commercial tri-di, when the first report came in via the CIA medical team's land line to Walter Reed Army Medical Center. Seven cases of an undiagnosed respiratory ailment had just been reported. The patients all exhibited symptoms peculiar to bronchial pneumonia—or pneumonic plague. Dr. Hershkowitz called Emmerson back immediately; classical pneumonic's incubation period was known to be thirty-six hours, or more. These were full-blown, galloping cases, every one.

Quite understandably, the news excited Emmerson. He urged General Patt to order all surface air intake halted at once over the guarded para-military network linking all forty-one redoubts. Before Patt could get on the air, Hershkowitz called again, and Emmerson nearly fainted. Washington's hospitals were becoming choked with cases. Within twenty minutes, the seven cases had blossomed into seventy, then seven hundred—then seven thousand! Unable to contact the President, or convene the National Security Council, General Patt declared martial law over the inter-redoubt network.

"We're in it," he said, grim-faced, tacitly ordering Strategic Air Command to red alert status. All aircraft, land-based missile squadrons, orbital missile launching stations, and Naval undersea forces were deployed for counterstrike preparedness.

The general then placed another call to the White House, returning white-faced, moments later, with chilling news: a press aide had informed him that President Blair was in the underground White House shelter, apparently ill. Shivering and coughing, he seemed to be having difficulty breathing. The Vice President was also afflicted.

Reports flooded in—an avalanche of hideous, doubt-removing assurances: Denver, Kansas City, San Francisco, Detroit, New York, Boston, Philadelphia, Los Angeles . . .

When Patt started to initiate the alarm which would have manned the redoubts, Emmerson cried, "We can't!" He looked shaken. "They're a step ahead of us, General. We'll have to assume that everyone aboveground is now infected, or at least exposed."

"Plague," said Volpone, "like something from the Dark Ages!"

"We've no choice. We must seal the redoubts," said Emmerson.

General Patt winced. "But . . . they're almost empty!"

"I know. It can't be helped. They've hit us with a clever stroke—every population center in the nation, all at once." Emmerson stared at the ceiling. "What's our best countermove?" he asked in a

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monotone. "Come on, put your minds to work; we have very little time."

"I got a notion," said Stillworth eagerly.

"Yes, Ray?"

"It's about 5:45 here on the Eastern Seaboard—the rush hour. Let's see how many commuters we can pull inside from the ITTS tubes. How's that sound?"

Emmerson sat forward, revolving the idea in his mind. "It may work," he said at last. "But if any redoubt becomes contaminated, we can write off the entire complex. Pneumonic is highly contagious. It's probably what they want—expect—us to do."

"Well, seems t'me we gotta chance it. There ain't much choice."

"I agree completely," said Volpone.

Patt spent a moment making up his mind. He nodded soberly.

"We have unanimous agreement," said Emmerson. "Alex, you know the ITTS system best. Can you think of any method of improving our odds against bringing contaminated people into the redoubts?"

Volpone started to frame an answer, then lapsed into silence. "Perhaps. Positive outward airflow in the tubes would satisfy noncontamination of passengers aboard the trains, would it not?"

Emmerson's brow wrinkled. "It might, if they had inspired no live organisms before boarding the train, but—"

"How'n hell's the bug bein' spread around?" demanded Stillworth. "Any idea?"

"We have no definite information as yet," said Emmerson. "Let's postulate air-vectored bacilli—aerosol dispensers, or something similar, would be a good bet."

"Kirilov!" General Patt made the name sound like a curse. "He has made fifteen trips home and back in his personal SST. Now we know why."

"But," objected Stillworth, "it'd take an army of immunized agents to distribute an' trigger that many aerosol bombs."

"Not necessarily. A very few, placed to take advantage of local prevailing winds, could have been triggered remotely by radio-controlled squibs, or timers." Emmerson paused. "The important question is how to hold trains in the tubes, and at the same time interdict passengers against contamination. Suggestions, Alex?"

Volpone suddenly clapped his hands with enthusiasm. "The ITTS safety officers; it may have been solved for us! Why hadn't I thought of that before? Each safety officer sits at a console, ready to manually override any malfunction in computer-operated traffic control circuits. There are multiple redundant feedback loops which—"

"For Chrissakes talk English!" complained Stillworth.

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"Listen; each safety station operates like a deadman switch. Pressure sensors in the officer's chair are connected to a time-delay relay. If the chair is unoccupied for twenty seconds, the relay drops out, opening that sector's ITTS tubes by energizing all motorized air valves full open, which quickly fills the tubes with braking air. The trains will come to a stop somewhere in the tubes automatically.

"Don't you see? Until each officer's chair is once again occupied, a steady, continuing outrush of compressed air will stop the ingress of *contaminated* air."

Emmerson perked up as he digested what Volpone had told them. "I think I understand," he said. "As safety officers become ill, leave their posts, the condition you've described will come about automatically. Chances are good that only 'healthy' people will be aboard the trains, especially the long interurban runs."

"Exactly. The safety stations are air-conditioned, of course. But no simple particle filtration will stop micro-organisms."

"Get on the redoubt network, Alex," directed Emerson. "Tell them what to expect, what to do."

"I could, er, rough out a procedure," said Volpone.

"There's no time. If we don't act instantly, ITTS emergency procedures will send the passengers topside—to their deaths."

"Just a second there," warned Stillworth. "Better tell 'em to freeze those passengers right where they're at. If any particular trainload's contaminated, it'll screw up a whole redoubt."

"A good point, Ray," said Emmerson. "We'll let them cool their heels for an hour or two in the trains while we set up medical checkpoints. One infected individual will determine the status of each group. Turning some away won't be easy, but . . . I've been told classical pneumonic takes three or four days to reach terminal stages, but Hershkowitz is postulating a new, fast-acting strain of bacillus. Our first step will be to develop antigen serum—"

"Damnation! I'll tell ya what we got to do first," cried the senator. "Hit 'em! Hit 'em high, an' hit 'em low; hit 'em with everythin' we got!"

"It may soon come to that, Ray," said General Patt. "But not yet."

"Why'n hell not?"

"Because," said Patt evenly, "up to now we've been out-maneuvered, out-foxed. That will cease, as of this instant. The Sino-Sov masterminds expect a retaliatory strike; they're prepared for it. Therefore, we will not oblige them—yet. We'll make no unconsidered moves out of sheer panic."

"Then we're *losers*, dammit!" said Stillworth.

"Not at all," said Patt coldly. "We will win in the end because we *must*."

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Volpone's thesis proved accurate. Dozens of local ITTS trains yielded passengers who were free of bronchopneumonic symptoms. After hours in quarantine aboard the stalled trains, they began streaming slowly past teams of overworked medics by the mystified, frightened thousands. The scene was repeated endlessly across the nation, causing Volpone to comment on the terrible irony created by circumstance: the common "workingman," homeward bound in an ITTS train by random chance, would be saved, while nearly three-quarters of a million carefully screened and briefed candidates were left to survive or perish as best they could.

It was after seven o'clock when the senior epidemiologist of Walter Reed Hospital's staff, rapidly falling ill himself, delivered four sealed vials containing live bacilli to the redoubt elevator head in suburban Maryland. He was met by a pair of volunteer medics from the CIA team who wore fully protective plastic suits complete with self-sustaining air bottles. The epidemiologist also passed over some notes written in indelible ink on mylar.

Carrying vials and mylar, the CIA medics—whose bodily hair had been shaved beforehand—chucked their protective suits into an incinerator at the entrance to A Level, undergoing three separate cleansing sprays before being readmitted to the redoubt. An hour later, the first preliminary report was laid before Emmerson.

The blame was placed squarely on a new, rapidly-incubating strain of *Pasteurella Pestis.* Laboratory animals on L Level had become infected by as few as five airborne organisms. Greatly accelerated incubation caused the animals to reach terminal stages in as little as one-half hour, which astounded the medics. Extrapolating from this, it was estimated that infected human beings would commence dying within four to seven hours, rather than the customary three or four days common with classical pneumonic. The infection's course, leading to severe bronchopneumonial edema, depended entirely upon the physical resistance inherent within each individual patient; the very young, very old, and the infirm would be the first to go.

Dismayed beyond words, Volpone and the others learned at nine o'clock of reported widespread infection within the People's Republic of China. The Soviet Union had, it seemed, practiced a particularly vile form of duplicity on her populous Asian neighbor. The pattern of World War Three began to reveal itself: Soviet Russia was engaged in knocking down her ideological Western enemy, and supposed Eastern Communist brother, at one and the same time.

Emmerson called a council of war, looking very determined as he faced them. "I've taken the liberty

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of making the following assumptions, judgments, and inferences," he said, searching their sober faces. "Before any of you voice objections, let me recapitulate. Afterward, we'll hear discussion and, hopefully, establish tentative courses of action.

"First, as General Patt already pointed out, we've been successfully out-maneuvered. The Soviet Union presumably penetrated our redoubt cover story—perhaps long ago—and used the information as a basis for the current BW attack. We've no way of knowing whether or not they are also aware of Luft. For the present, let's assume they are.

"Secondly, the nature of their soft attack—though devastating, we will refer to it as a 'soft' attack—and the USSR's failure to follow it with massive thermonuclear bombardment, leads us to believe Russia is looking forward to easy victory, both here and in China. Our only reasonable procedure would seem to be one of watchful waiting until we begin to see—"

"Waitin'!" sneered Stillworth. "Sure, let's be humane an' hold off! Let's be pushovers, too chicken to strike back!"

"Be still!" General Patt half-rose from his chair. His customary patience had vanished. "Let him finish, Stillworth. It makes sense; if at all possible, the USSR would like to occupy a fully intact America, not a radioactive field of rubble."

"That was precisely my contention," said Emmerson, nonplussed by Stillworth's outburst. "We can look for immunized troops to be landed here after chaos mounts to the utmost—say in a week."

"Not if we *hit* 'em!" raged the senator.

"They expect that," countered General Patt. "They may have forty, fifty divisions underground, waiting for the effects of our counterstrikes to diminish."

"An' you're tellin' me we'll sit on our duffs an' watch the United States of America go down the drain without liftin' a finger?"

"Absolutely not," refuted Emmerson. "We're trying to decide upon the best possible course of action, Ray. We must stop doing anything predictable, anything which can be anticipated. We have time—not much, but perhaps enough—to allow medical development of a counteracting antigen serum. If we remain cool-headed, deliberate, there's a strong likelihood of turning the situation around, of saving hundreds of thousands of lives.

"Then there is China," continued Emmerson. "It's a relief, certainly, to find we're at war with only one enormous power, rather than a coalition of two. We must establish communication with China's leaders at once. Now that Russia has shown her hand, we automatically become allied with China. We may conceivably help China to—"

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"*Help* those schemin' Reds?" Stillworth was beside himself. "How can ya even suggest such a thing, Emmerson?"

"I think you're correct, Rolfe." Patt ignored Stillworth completely. "Our ultimate salvation may lie with the Chinese."

Senator Stillworth began ranting uncontrollably. When an aide entered the command center, moments later, and tried to inform him of a call, the senator was too worked up to even hear him. Volpone took the call. The caller turned out to be Nat Abrams.

"Where are you?" asked Volpone, looking into the face of death.

"In . . . New York," said the TV executive, coughing. "I feel rotten, Alex. What is it?"

Volpone told him in solemn tones.

"Plague!" Abrams blanched, staring from the video tube in horrified disbelief. "Wh-what can I *do?* How can I get help?"

"The redoubts are quarantined," said Volpone with sympathy. "I'm sorry, Nat. Get to the nearest hospital at once."

"Quar—" Abrams broke off, coughing spasmodically. "But . . . people are sick, dying all over town. For the love of God, put Ray on, will you?"

It took Volpone several seconds to gain Stillworth's attention. He watched darkly as Nat Abrams pleaded with his friend, not liking the scene. Then, with a sour expression, he rejoined Patt and Emmerson.

"Six hours," said General Patt, "is every minute we can afford to wait. It's almost midnight now. I'm going to invoke a six-hour countdown, beginning at twelve."

"But, you're asking *miracles* of Hershkowitz and his staff," objected Emmerson. "Six hours won't give them sufficient time to evolve antigens. Can't we stretch it, give them more time?"

"I wouldn't dare." General Patt was stern. "If our SAC aircraft commanders, or Trident submarine captains, become too ill to initiate the counterstrike, we've lost."

"But, General—"

"Lost!" reiterated Patt. "I can't let that happen. Should nothing new develop by 6:00 AM, we will launch a concentrated retaliatory strike against the USSR. We will hold *nothing* back."

Rolfe Emmerson looked very drawn. He nodded glumly, then got up and hurried from the command center.

XVII

May, 1988

Leaving the command center in Emmerson's footsteps, Volpone tried to lie down for a while. Unsurprisingly, sleep would not come. Rolfe Emmerson's call, half an hour later, provided a welcome excuse for rising and hurrying back down to M Level.

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Obviously sorely troubled, the CIA Director met him at the elevator, leading him into an empty office. "Alex, it isn't working out," he said. "I just came from the lab; the medics are working in a frenzy, but with only five and one-half hours to go . . ."

"We mustn't expect miracles," comforted Volpone.

"Nor will we get them," assured Emmerson. "The bacillus shows signs of being hardy, laboratory-cultured; probably a mutated strain evolved over a period of years. If Hershkowitz were to develop effective antigens tonight, it would still take hours—days—to produce and administer serum. And I'm afraid we'll lose three redoubts. Perhaps four."

"Contamination?"

Emmerson nodded. "Denver-Cheyenne, Detroit-Cleveland, and Houston-Austin were all understaffed. At least one contaminated trainload slipped past the medical screening and entered each of them. New York-Trenton's fate hangs in the balance; we don't know whether or not they'll be able to contain the infection on upper levels."

"New York-Trenton?" Volpone was stricken. "I just spoke to Seymour and Vico," he said. "Both are in that redoubt."

"I know. We'll continue to hope for the best, of course, but . . ." Emmerson paused. "What I was driving at, a moment ago, is that General Patt will not countermand the six o'clock strike unless the situation changes drastically. I sympathize with his position; he has the big picture to contend with. I've listened to arguments from his staff, trying to persuade him that military personnel from the 'clean' redoubts, wearing self-contained protective suits—we have a few dozen in stores—can go out later and man the SAC missile launch bases. Patt's comments about inexperienced crews manning his SAC complexes were elegantly profane."

Volpone was grim. "Not even in ultimate emergency?"

"Patt insists not, and I believe him; it couldn't be done. We must deliver a massive, all-out strike if—"

"And go down swinging," finished Volpone bitterly.

"Perhaps." Emmerson sighed. "The alternatives are clear-cut. Between you and me, Alex, I have the gut feeling that once multi-megaton warheads start flying back and forth between here and Russia, nothing in God's universe will stop the conflict from ravaging the entire world. The result will be . . . Armageddon."

"Frightening, but plausible," agreed Volpone. "If it should come, we'll have to survive belowground. Thank God we're prepared!"

"Are we?" Emmerson regarded the other closely. "Think it through carefully. We've managed to bring

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a rag-tag collection of uninfected private citizens into the redoubts. Patt suspects, justifiably, that Russia's postulated havens contain a number of Red Army divisions. What does that imply?"

"Invasion, of course, after we've spent our forces," said Volpone, "and after radioactivity levels decrease to a point where Soviet forces can deploy. For us to strike now would only postpone the inevitable. *If* Patt's right."

"I think he is." Emmerson radiated sudden enthusiasm. "But Patt mentioned something earlier which gave me a notion I think worth following up. We *must* do something to give Patt proper grounds for delaying the retaliatory strike. It's our only hope."

"I agree," said Volpone, "though I thought you'd already decided the counterstrike mandatory under the circumstances."

"It is," said Emmerson, "under the circumstances. I propose changing the circumstances, reshuffling the deck."

"How?" Volpone became very interested.

"It struck me," said Emmerson slowly, "that we aren't playing all of our available cards, Alex. Patt suggested that Ambassador Kirilov had most likely imported plague dispensers under the cloak of diplomatic immunity. He'll be immunized, of course. Right this minute he's probably sitting in his Washington embassy, reporting the effectiveness of the BW attack. I want Kirilov brought into the redoubt, Alex. At once."

"To question him?"

"Well . . . yes. But that isn't the primary reason." Emmerson removed his glasses, polishing them with a handkerchief. "Follow my reasoning," he said. "Tell me if the logic is flawed.

"We're caught in a two-way squeeze; one a bacteriological vise, the other of our own making—time. Assuming the Soviet Union has learned about our Lifeboat Project, they've come up with a very effective countermove: infecting our urban populace with swift-acting pneumonic plague, creating chaos.

"The USSR's major premise seems to have been that we would hurt them in retaliation—hurt them very, very badly—but not *kill* them as a nation," continued Emmerson. "A price they seem willing to pay. They predicate the day when their armies will be sitting cozy in underground havens, waiting until radioactivity levels diminish to a point where invasion and occupation of our decimated nation, and China, will be feasible. Their plan worked—almost."

"The Commuters?" guessed Volpone. "But, I don't see—"

"The commuters," confirmed Emmerson with an affirmative headshake. "We've managed to do something—thanks largely to the operational design of ITTS—which their planners didn't take into ac-

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count. Hundreds of thousands of Americans are safely underground, whereas their scheme calculated that fast-incubating pneumonic would be brought into the redoubts as the panic alarm went out and candidates scurried frantically for cover.

"The upshot is simply this: we must persuade them that we, too, have a large standing army poised underground, waiting to repulse their landings."

Volpone was profoundly baffled. "We don't, Rolfe."

"Ah, but do *they* know that?" asked Emmerson, ever the cool chessmaster. "We must make them believe we do."

"I can't imagine how."

"It calls for a bluff, Alex," said the CIA Director quietly. "A bluff must always be on the grand scale; never mean, never small-minded. I suggest we rub the Soviet Ambassador's nose in the fact that instead of a small technical staff, each redoubt is manned to the hilt with battle-ready elite troops."

"How in the devil can we convince him of something nonexistent?"

Emmerson's wan smile was confident. "There are many, many people in each redoubt, are there not? If we were to have sterile teams from each redoubt go topside and bring down 'clean' weapons, uniforms, military accouterments, then dress and arm the commuters accordingly, would Ambassador Kirilov know the difference over video?"

Volpone digested it. His eyes widened in amazement. "Rolfe, that's simply brilliant! Remind me not to play poker with you again."

"We'll show Kirilov that we've matched his country move-for-move—and *more;* show him undramatically, matter-of-factly, that Russia cannot win in the end. If we succeed, the USSR may back down and agree to meet at the conference table. The fact that we've made no immediate counterstrike probably has them sweating already."

"It might work, Rolfe. Then again . . ."

"Have you a strenuous objection?"

"There's always the chance," surmised Volpone, "that calling their hand might drive them toward full-scale thermonuclear war."

Emmerson swayed his shoulders as if to say, 'who knows?' "Remember, they want an intact America if at all possible, not a pulverized wasteland populated only by the dead. Were they to mount a major nuclear strike, their intended invasion would be delayed indefinitely, if not canceled; we'd be no worse off, essentially, than we are now. My way could buy us time to negotiate. The path we are taking now means . . . finis."

"Kidnapping the ambassador won't be easy," said Volpone. "He's probably surrounded himself

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with an armed, immunized staff. Don't mistake me; I think it's a brilliant concept, Rolfe. Still, it could require sneaking up on a wide-awake tiger."

"I envision a commando raid," said Emmerson. "Kirilov must be taken alive, unharmed, if what I have in mind is to succeed."

"Um, it will be a delicate piece of work, if not a suicide mission." Volpone beamed. "Shake my hand; it's worth every ounce of try either of us has left in him."

Riding the slideway with Emmerson toward the command center, eager to convince Patt of the CIA Director's ingenious plan, Volpone saw four men and two women standing at the foot of a steel stairway leading upward to one of the air storage complex's control booths. The great compressor lay silent, as did all others in the vast hall, now that air intake from the surface had ceased.

"What are civilians doing on M Level," Volpone asked.

"Stillworth's catch." Emmerson was preoccupied. "Senator Lewellyn is on the left; Hoo Hanford, the publisher, is standing next to that Army officer who absconded with all that secret data from the Sacramento-Reno Redoubt last month."

Volpone grunted. "Ah, yes; Major Croft, isn't it?"

"Craft, I think," said Emmerson.

"Craft, then. Have you read the report on his escapade?"

Emmerson nodded. "A remarkable adventure," he said dryly.

Volpone studied the group closely. "Excuse me," he said suddenly, acting on impulse. "I'll catch up with you, Rolfe."

Leaning backward slightly in order to more easily preserve his balance, Volpone stepped from the slideway, striding energetically across the granite floor. Craft's audience was much too intent upon Craft's lecture to notice his approach.

"Major Craft," boomed the Secretary of Transportation. "It's good to see you again."

Volpone was greeted by five startled faces. Craft merely swung toward him, standing on the lowermost riser of the steel stair, his features perfectly composed.

"Mr. Volpone," said Craft calmly, introducing Betty, Virginia Lewellyn, and the others without noticeable inflection.

Alex Volpone's antennae were full-out. He sensed outright hostility radiating from Senator Lewellyn and the red-haired officer named Archer, strong waves of feminine interest from both women, and latent outrage boiling up inside the lanky, horsefaced publisher. Craft, however, displayed no emotion at all, which gave Volpone cause to ponder. "I simply wanted to stop for a second and compliment your courage and resourcefulness, Craft," said the industrialist. "Eluding Parkinson's men and making

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good your escape was an amazing feat. I'd have wagered heavily against your chances."

"Thanks," said Craft. "I might just as well have stayed where I was. I guess I did what I had to do."

"Of course," said Volpone. "Each of us must do as he thinks best."

"Including you, I suppose." Lewellyn's sarcasm was unalloyed.

"Why yes," said Volpone. "Including me—and my associates. Where would you be now, Senator, if we hadn't?"

Lewellyn flushed. "Either dead, or dying—*or* home in bed sleeping," he said harshly, voice cracking with emotion.

"I sincerely doubt the latter."

"Do you? Do you know for a fact that your air stealing madness didn't *force* the Soviets to germ warfare, that you weren't the cause rather than the deterrent? You drove them to the wall," said Lewellyn with heat, "gave them no alternative, except this!"

"Ridiculous!" Volpone bristled. "The constituted authorities refused to listen, so we went ahead on our own. If you knew the heartache and pain we experienced—"

"I know the heartache and pain my country's experiencing!"

Volpone met the California senator's eyes, trying unsuccessfully to stare him down. "We've done nothing I feel necessary to apologize for," he said stiffly.

"In bypassing the Constitution and elected representatives of the American people, Mr. Volpone, you may have thrust five thousand years of civilization right over the precipice."

Now thoroughly angered, Volpone folded his arms. "I'll not waste any more of your precious time, Senator. Cherish your opinions, but bear in mind that we've entered into a struggle for survival. Let us pray we are given the opportunity to survive."

"No thanks to you!"

"Forgive me for bothering you!" thundered Volpone. Turning on his heel, he marched back to the slideway. Approaching Craft and his friends had been a grave misjudgment. Hurrying to catch up with Emmerson, he dismissed the incident as trivial, his brisk stride augmented by the slideway's stately progress.

Senator Stillworth was crowing about something when Volpone entered the command center. Emmerson sat tapping a pencil on the conference table, staring into space, while General Patt paced the chamber's floor, now and again glancing woodenly at the display screens filling one wall.

Stillworth gloated. "Now we're in it for sure!" he hooted. "We may take a temporary lickin', sure; but we'll *win* the war, even if we lose the goddam battle!"

Volpone ignored Stillworth, sliding into the chair next to Emmer-

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son. "Have you explained your idea to Patt?" he asked.

The CIA Director refused to meet his eyes. "It's too late."

"Too . . . late?" Volpone looked up at Stillworth.

"We're in a shootin' war at last," rasped the portly senator.

Patt paused in his tiger-pacing. He regarded Volpone fixedly, agony in his gaze. "One of my colonels . . ." General Patt cleared his throat. "A SAC base in Wyoming . . . became infected. The colonel saw his officers and men sick, dying. Can't really blame him; it was a dying effort for revenge."

Alex Volpone stood up, knees suddenly wobbly. "You mean he . . .?"

Lieutenant General Michael Patt's nod had a hangdog quality about it. "The colonel salvoed on prime Soviet targets, Alex. Seven birds carrying MIRV warheads are on their way over the Pole, and all the good intentions in the world won't bring them back!"

XVIII

May, 1988

USAF Skywatch Satellite Alpha and both missile launching stations had been knocked out the preceding evening by Soviet orbital missiles. Before it too blossomed into an Earth-circling cloud of radioactive dust, Skywatch Beta's crew managed to report SAC's inadvertent strike in comprehensive detail. Four sober-faced men gathered in M Level's command center, learning bit-by-bit of repeated hammer blows being rained upon Moscow, Kiev, Minsk, Gorky, Leningrad, Odessa . . .

Still, there had been no answering Russian nuclear strike. At 2:45 the tension became unbearable. Doubly determined to launch an all-out, annihilatory attack as more and more SAC bases reported pneumonic raging within their underground silo complexes, General Patt's characteristic reserve began to crack. Though many Trident submarines were at sea, he refused to be convinced that falling back solely upon naval retaliatory weapons systems was a feasible alternative to the prospective six o'clock strike. Emmerson doggedly persisted, urging the general to hold off and give his medical team what he termed a "reasonable chance" to develop antigens, which infuriated Stillworth to near apoplexy.

Volpone waited patiently until the senator quieted down somewhat before speculating, "Maybe we can still adopt your plan, Rolfe."

"What plan?" demanded Patt irritably.

The harried CIA Director glanced at the wall chronometer. "Time's growing short," he said. "I'm surprised we haven't been hit."

"Perhaps no Soviet nuclear strike will take place," surmised Volpone. "Mightn't the USSR consider our missiles part of the limited retali-

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ation they were expecting? After all, they've already 'hit us' in a sense. If they *are* lying doggo, waiting us out . . ." He left the thought unfinished.

General Patt perked up, concentrating. "A good point, Alex. In the heat of the moment, that aspect never occurred to me."

"Explain your plan, Rolfe," urged Volpone.

Emmerson blinked, looking haggard, then outlined his scheme for kidnapping the Soviet Ambassador, proving to him that America had—literally—an ace in the hole: bogus underground 'troops'.

"What's that?" demanded Stillworth. "What did you say? Bring that murderous Red bastard in *here?*"

Emmerson patiently explained why it would be necessary.

"Now I heard it!" Stillworth's florid face contorted in outrage. "That is, all in all, the silliest goddam notion you've come up with yet, Emmerson! I cain't believe you're serious!"

General Patt remained silent, contemplating the ramifications of Emmerson's proposal. "What the hell have we got to lose? It might work. If not, we've neither improved nor worsened our position."

"That's essentially quite correct," said Emmerson before Stillworth could object. "It must be done quickly and rather quietly, if possible—a small detachment of assault troops, led by someone fully informed, cool-headed, and determined. We've no way of learning what sort of defenses Kirilov has surrounded himself with at the embassy. He must be taken alive and unharmed, or not at all."

Volpone's eyes lighted. "Rolfe, you've just described Major Craft; cool-headed, resourceful, and *very* determined," he said. "I wonder if he can be persuaded to lead the mission."

"Who are we talking about?" Patt looked perplexed.

"That Army engineer who slipped out of the Sacramento-Reno Redoubt last month with all our secrets," enlightened Volpone.

"Oh, yes." Patt's lips compressed. "Persuade him, hell! I'll order the son-of-a-bitch to go if you're sure he's the man for the job."

"That might not be, er, wise, General," cautioned Volpone. "Let me talk to him. He's reasonable, intelligent; I'm certain he can be made to see the importance of doing this."

"Get on it then. Quickly!" Patt returned his attention to the wall-filling array of video monitors, holding a deaf ear toward Senator Stillworth's sarcastic outburst.

Lew Craft's ready agreement came over the vociferous objections of both Senator Lewellyn and Betty Dancer that his leg had not yet fully healed. When things quieted down, Craft made two stipulations: one, that Major Archer be allowed

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to accompany him to the Sino-Sov Embassy; second, that he be allowed to hand-pick volunteers from the marine regiment to man his assault team.

Emmerson and Volpone gave him *carte blanche* permission to take along anyone he saw fit. The CIA Director managed to embarrass himself, stressing over and again the vital importance of grabbing Kirilov unharmed, then hurried away, anxious to advise the other redoubts to go topside and bring in sterile weapons and uniforms as quickly as possible, and to rehearse America's "standing army."

It was five after three when two medics finished dressing Craft, Archer, and the marines, for their sortie. Craft had selected five enlisted men, telling them the simple truth: they would all be betting their lives that a Soviet nuclear strike would not take place while they were topside in Washington, adding that, should a torn suit expose them to pneumonic, they would be forced to remain aboveground. The marines were leery of the operation until told where they were going, and why. Armed with submachine guns, grenades, and sidearms, the seven-man team was given flat photographs of Ambassador Kirilov which Emmerson had pulled from the redoubt's CIA files. Their air bottles would sustain them four hours. Before Craft sealed his headpiece, Volpone drew him aside.

"Things may look grim and rather hopeless up there," he said. "The men may give you trouble, perhaps try to aid someone who desperately needs help. You must not let that happen."

"I think I understand."

"I'm sure you do," said Volpone. "I felt it my duty to prepare you, nevertheless. Steel yourself; ignore anything which might interfere with your specific task. Dr. Hershkowitz tells us certain individuals may be naturally immune to the plague. You could encounter scenes of horror and savagery. Keep your distance, and go on. Your mission is much, much more important."

"I'll be an ice cube, Mr. Volpone."

"I suppose that's why you're going." Volpone's brief smile was encouraging. "Craft, you may not admire my methods or principles, but I assure you I had, and have, only the country's best interests at heart. Please try to believe that."

"I do." They solemnly shook hands. "Don't worry; we'll fetch him." Snapping down his fishbowl, Craft found it suddenly difficult to communicate. The all-enclosing protective garments had been designed for individual use, without two-way radio headsets. Riding upward in the elevator, he gingerly touched helmets with Red Archer, asking if he could hear what Craft was saying.

"Sure; good enough." Archer bobbed his chin.

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The cluster of buildings atop the elevator shaft, advertised publicly as the Laurel, Maryland, US Marine Corps Motor Repair Depot, lay well-lighted but unoccupied as Craft's small army hustled through. Craft checked fuel gauges in several vehicles before choosing a rotary-engined troop carrier. Boarding with haste, a lance corporal started the vehicle, driving through the night out the post's main gate toward the Baltimore-Washington Parkway that passed less than a mile to the southeast.

The twenty or so miles into downtown Washington rolled past swiftly. They encountered no vehicular traffic until crossing the Anacostia River into the District of Columbia—that a lone, red sports car, going the opposite direction at a tremendous rate of speed.

At Bladensburg Road, the parkway turned into New York Avenue. The city's streets looked normal, but eerie; buildings were dotted with emergency lights, cars were parked lawfully, everything was in its place, looking exactly like any other quiet after-hours night in the nation's capital—except for the total absence of living things. There were no pedestrians, no stray dogs or cats roaming the sidewalks, no heads or shoulders visible in any of the few lighted windows they rode past, nor were there any prowl cars or taxis.

The troop carrier rolled across New Jersey Avenue against a still-operating traffic light. The ruddy glow of a burning building illuminated the sky several blocks to the north; Craft made a bet with himself that no one would bother putting out the fire.

The vehicle veered sharply around two bodies lying in the street near Mt. Vernon Square, slowing as if to stop. Craft urged the driver onward with a slap on the arm. Then, as they were passing the central library, the driver took one hand from the wheel and pointed excitedly. Following the line of his arm, Craft had the urge to reach in through the acrylic bubble and rub his eyes. A solitary man unconcernedly walked his dog through the small park surrounding the library. Craft and Archer exchanged baffled glances.

Just beyond Eleventh, a middle-aged woman could be seen crawling along the sidewalk. She faltered and rolled on her side, not looking up as they drove past. Craft craned to watch her out of sight, the urge to stop and go to her aid all but overpowering.

He alerted his squad with hand signals, commanding the corporal to turn right on Sixteenth Street. Two smashed autos formed a mangled heap of metal and glass in front of the Statler-Hilton Hotel where he'd stayed five months ago upon returning from Antarctica. Five months! It seemed five years.

Sheathed in dark stone, with

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twin Chinese and Soviet banners hanging from fourth-floor staffs, the monolithic Sino-Sov Embassy loomed beyond L Street. Erected after the old Soviet Embassy had been razed to make room for it, the building's lights were oddly reassuring. Craft had the driver pull to the curb across from Franklin University, passing a flat photo of Ambassador Kirilov to the lance corporal, another to Archer, and keeping one himself.

He pressed his helmet against Archer's. "Take four men and reconnoiter around back, Red. See if there's a delivery entrance. The corporal and I will have a look at the lobby. Don't fire unless you have to. Move!"

Archer made a thumb and forefinger doughnut in response, tapping the shoulders of four marines. They trotted away toward the mouth of the limousine entrance running between the embassy and the *Washington Post* building.

"Stay close," urged Craft, touching helmets with the corporal.

"Wish we didn't have on these stinkin' yellow suits, sir," complained the marine. "They make great targets."

Craft grinned mirthlessly. "Try doing without yours, friend. Quit bitching, and come on."

The embassy's lowermost windows, ten feet above the sidewalk, were covered with ornamental, expanded metal grilles. Craft hugged the building's stone facade, moving forward until he could peek into the main entrance, a tasteless, pillared affair enclosed by tinted plate glass walls. Inside the glass, a grandiose mosaic depicted rippling Sino-Sov banners borne by a legion of smiling workers, while larger-than-life bronze statues of Mao Tse-tung and Lenin hulked in either corner. The lobby was brightly lighted; there was no one in it.

Craft pulled back, puffing his cheeks and scowling. The setup smelled *wrong*, though he couldn't put his finger on a specific reason. He peeked again, scanning the lobby item by item, and finally spotted three wide-spaced apertures high on the paneled wall.

"No dice," he told the corporal, helmet-to-helmet. "The lobby's covered by closed-circuit TV. The doors are almost certainly locked. Maybe booby-trapped."

"How about a grenade, sir?"

"No good," said Craft. "It might start a ruckus; we need The Man alive and in one piece."

As the marine corporal trailed Craft back toward the rear of the building, submachine gun at the ready, Archer and his squad emerged from behind a hedge. "Any luck?" asked Craft, touching helmets.

"Uh-uh. Heavy-gauge steel doors cover the auto entrance. It'd take dynamite to get in that way. What next?"

Craft pondered, looking the building over, then pointed up-

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ward. A thin column of smoke wafted bits of fluttering, flaming ash aloft from a rear chimney. "Someone's in there," he said. "Dammit, I guess we'll have to make some noise. Let's try around front."

Reaching the Sixteenth Street sidewalk, Craft chose the lighted window farthest from the lobby. Two marines boosted him up until he could grasp the ledge. Getting one hand on the grille work covering the window, he clawed to raise himself until he could see inside. The room, a spacious office, was unoccupied. Craft eased down, dropping back to the sidewalk.

He touched helmets with the lance corporal. "See if you can find any sort of line in the troop carrier. We'll rig a lanyard, tie a grenade to the grille, and pull the pin from down here. Hurry!"

The marine took off at a dead run, trotting back three minutes later with a length of braided nylon tow rope barely small enough to fit through a grenade pin's ring. A tall, rangy marine stood on the shoulders of two mates, wedging the grenade tightly into the lower grille, then dropped to the pavement, leaving the thick nylon tow rope dangling.

Craft grabbed Archer's arm, bringing their helmets into contact. "When she goes bang, me first, Red. Then you and the others. Tell your men to be careful going over the broken glass; if one of them cuts his suit, he'll be a permanent guest."

Archer made a terse head movement, turning to give the orders. When everyone was out of range, Craft pressed himself flat against the embassy and signaled the tall marine to pull the pin.

He watched the man run, counting seconds until a ripping blast echoed along Sixteenth Street, sounding muffled through the acrylic bubble of his headpiece. The warped, smoking grille work swung back and forth for an instant, held by one remaining lag bolt, then clattered to the sidewalk.

Craft ran to the spot, kicked aside the grille, and lifted his foot into the stirrup formed by the joined hands of two marines. Vaulting upward, he rested his weight against the building, unslung the submachine gun from his shoulder, and quickly chipped away shards of glass clinging to the bottom of the frame. Pushing the weapon in ahead of him, he chinned himself, muscled-up, and rolled headfirst into the office. Shattered glass had showered over the carpet, pocking the far wall. Craft helped Red climb through, then went to the door and eased it open.

Papered in rose-colored fabric, the corridor lay softly lighted and silent. A philodendron in a glazed urn embellished with Chinese ideographs rested at the corridor's junction. They moved toward the

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lobby, gingerly opening door after door, finding only empty offices.

"Have your men search the ground floor," Craft told Archer, helmet-to-helmet. "You and I will see what's upstairs."

The second floor contained a library, a huge formal dining salon, and a sizable ballroom floored in parquet. There were any number of doors which they didn't bother opening.

Craft led the way up to the third floor, taking the stairs one riser at a time, his submachine gun's snout elevated. Again, the hallway was empty. The hair at the nape of his neck lifted; the Sino-Sov Embassy was like a morgue.

Moving with extreme caution, Archer opened the first door to the right of the stairs, beckoning urgently. It was a bedroom; a fully-dressed Oriental of indeterminate years lay sprawled across the bed, breathing with apparent difficulty. His eyes were open. If he saw the intruders, he made no sign.

Craft opened the next door along the hall. A man was huddled on the floor near the door; another lay on the bed, chest heaving.

At the end of the hallway loomed double walnut doors inlaid in tortoise shell. Craft worked the latch silently, standing to one side. Inside was a paneled study; bookshelves lined three walls. The fourth was taken up by a large marble fireplace. His back to them, a man wearing a dressing gown was patiently feeding papers to the flames. He turned to face them incuriously, then resumed slipping papers into the fire, shoulders hunched as if expecting a bullet.

Craft and Archer moved forward into the room. The man turned again to face them. Hands dangling defenselessly at his sides, he said something indistinguishable.

When they were closer, Soviet Ambassador Vasili Kirilov shouted, "Well, gentlemen; have you come to surrender?"

Kirilov listened attentively, his attitude stoic, his thinning hair still damp and unruly from repeated cleansing sprays that he, Craft, and the others had undergone upon entering the redoubt.

"That is preposterous," he said quietly when Emmerson at last fell silent. "You would have me believe this . . . fabrication?"

"It's the unvarnished truth, Mr. Ambassador," said Volpone.

Kirilov smiled almost sadly, disregarding Volpone. "Your gambit is clever, Dr. Emmerson. You hope to convince me, and through me the Soviet Government, that you have a quarter-million trained troops sequestered here and there underground. But the concept is irrational, thoroughly unbelievable. There is also something amiss with your arithmetic. We learned of more than forty underground establishments, yet you mention only thirty-seven."

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"Four have become contaminated," admitted Emmerson. "Hoping for one hundred percent interdiction would have been wishful thinking. We are also on the verge of effecting an antigen serum with which to treat survivors. In a matter of hours, we will have it."

Kirilov solemnly shook his head. "No, I do not intend to buy my life by agreeing to terms," he said. "My life is of no consequence. My life is forfeit."

"Your life is in no danger," corrected General Patt, "even though the USSR has committed an unprovoked act of war. We hope to avert total disaster by showing your government the magnitude of their mistake. You cannot win, Mr. Ambassador."

"Unprovoked?" Kirilov was ruffled. "And was *your* act, then, not an act of warfare, General: pirating and storing vast quantities of the Earth's atmosphere?"

"Naturally," said Patt stiffly, "you would have preferred us to wait until your laser weapon was operational," earning a wary look from Ambassador Kirilov.

"The air depletion project," rumbled Volpone, "was a device employed to gain, and retain, an upper hand over two Communist societies who had joined in a common front, brazenly advertising their immutable purpose to enslave the world."

"Rationalization, gentlemen!" Kirilov's composure weakened. "Arguing ideologies would seem futile, now. I defy you to show me your quarter-million healthy, battle-ready troops."

Emmerson pointed to the wall chronometer. "It's four-twenty, Mr. Ambassador. In one hour and forty minutes we'll be forced to launch a concentrated strike against every military and civilian target in the Soviet Union. Your country will be destroyed."

"To rise again," said Kirilov, eyes glistening.

"I'm afraid not, Mr. Ambassador," said Volpone distinctly. "The pneumonic attack effected its purpose, but large, scattered portions of our populace will survive. After repulsing your landings, we have no doubt as to the eventual outcome. We have the means to outlast you. And we will."

"You will permit *me* to doubt," said Kirilov forcefully. "It will be interesting to see what manner of sideshow has been prepared for me."

Sensing the propriety of a dramatic gesture, General Patt lifted the remote controller lying on his desk. Without a word, he began switching on one video monitor after another in the curved bank covering the command center's wall. In every monitor the scene displayed was nearly identical: massed "troops" milled about or stood at parade rest under the vaulted ceiling of each redoubt's D Level plaza.

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Video monitors continued to light, one by one; the effect was dazzling, even to Emmerson, Volpone and Patt—cameo-clear, tri-di-holograms, in very authentic color, of entire armies drawn up in ranks for inspection.

The general continued switching on monitor after monitor, each image augmenting the effect of the preceding. Below them, the name of each redoubt glowed into being.

"A commendable collection of dolls," speculated Kirilov. "Am I asked to believe that *all* of these troops are indeed safely underground somewhere?"

"Where else could healthy troops be just now?" asked Emmerson, answering a question with a question.

Ambassador Kirilov glanced sharply at Emmerson, then rose. He paraded past the glowing wall, hands behind his back, eyes masked. "You have gone to immeasurable trouble, I see," he said slowly. "But this could have been arranged in any of a dozen ways. I'm afraid I must demur, gentlemen."

"All we ask," insisted Emmerson, declining the bait to argue, "is the opportunity to sit down and negotiate with your government. We need your help to avoid what now seems inevitable: absolute and utter world destruction."

"Negotiate, er, toward . . . what end, sir?"

"An immediate cessation of hostilities," said Emmerson. "The formation of an interregnum international council, with a view toward eventual establishment of a world government."

Kirilov cocked his head, his face inscrutable. "It is too idealistic, too flimsy, Dr. Emmerson. I judge you to be sincere, but . . ." Kirilov paused. Second from the left in the bottom row of monitors, was a hologram labeled Washington-Baltimore. As in the others, row upon row of uniformed "troops" stood at parade rest.

"If I am not mistaken," said Kirilov, pointing, "we are here in this complex, are we not?"

"We are," said Patt tersely.

Kirilov half-smiled. "Might I be permitted to personally inspect these troops?"

"Certainly, sir. At once." Patt pushed a button on the remote controller, calling in a natural voice, "Atten-hut!" Several hundred thousand "troops" came to attention in the various redoubts; some a bit raggedly, though the Soviet Ambassador seemed not to notice. "This is Lieutenant General Patt speaking. Thank you all for your cooperation. The Washington-Baltimore unit will stand by for immediate inspection. All other unit officers may dismiss their men."

Kirilov watched intently as a confusion of barked orders emanated from varied speakers; the massed units dissolved into ran-

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dom, moving masses of men and arms—save one.

"This way, Mr. Ambassador," urged Emmerson. "We must hurry."

Kirilov remained silent and introspective riding up to D Level in the elevator, keeping his thoughts entirely to himself. Alex Volpone said a mental prayer of thanks for the fact that Washington-Baltimore was one of two redoubts which had been sponsored and funded by the Department of Defense. The marine regiment Kirilov would be inspecting was made up of authentic combat troops, battle-hardened in the recent Mideast War, not civilians dressed in soldier suits.

The party left the elevator and entered the vast floor of D Level to an accompanying, "Atten-hut!" and the concerted click of thousands of polished boot heels.

Emmerson and Volpone hung back, allowing Patt and two of his aides to follow Kirilov down the rows of arrow-straight marines.

As the ambassador stopped twice to speak briefly to men in the ranks, the scene indelibly stamped itself in Volpone's mind: the high granite ceiling, looming over a fully mobilized and equipped marine regiment, while the color guard's haughty Stars and Stripes hung in the breezeless, air-conditioned vastness of D Level's great hall.

When General Patt returned with Kirilov in less than five minutes, the ambassador's face was expressionless. Volpone hoped fervently that it was more than his imagination which detected a wavering glint in Kirilov's dark, Slavic eyes.

XIX

May, 1988

Re-entering the command center, Ambassador Kirilov seemed far too self-composed to be encouraging. Volpone groped for a cigarette, realizing why his hands were trembling: the wall chronometer's digital readout now stood at 04:53.17.

Kirilov asked if he might take a minute to refresh himself. Patt curtly ordered the pair of marine noncoms on duty to escort him to the washroom, then turned to survey his situation reports while Volpone and Emmerson sat down with unfelt casualness.

Volpone found himself hypnotized, watching the chronometer dribble precious seconds into the bottomless pool of eternity. At 04:53.47 he looked away with a faint shudder, asking, "Is Craft ready? We'll want him on instant notice if Kirilov should, er . . ."

The CIA Director surfaced from a gloomy study. "Craft was dressing for topside when I called from D Level. He'll be waiting outside the command center if . . . when we need him, Alex."

"I'm still not clear on why you want Kirilov taken back to his embassy if he does . . . that is, if he should decide to contact his government."

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"Insurance," explained Emmerson. "It will be safer to have him use his own communications line. Think about it; were he to contact the Kremlin via the White House hotline, or over normal satellite audiovisual channels, mightn't it arouse their suspicion—their man, on our comm link?"

"I see your point. How do you read Kirilov's reaction, thus far?"

Emmerson squinted at the video displays, not really seeing them. "Cagey," he said, "on the fence. He's still undecided. I wish Ray Stillworth were himself these days, Alex. For all his faults, he's the finest personality judge I've ever run across. Where has Ray been keeping himself?"

Volpone shrugged. He stubbed out the half-consumed cigarette with one vicious jab, reaching for another. "Off brooding someplace, probably—or drunk. I haven't seen him since Kirilov was brought in, Rolfe. Say, do you really suppose we have a chance?"

"With Kirilov? Absolutely," said Emmerson. "He's far too intelligent not to chase the bait to some sort of logical conclusion, even if he refuses to swallow it whole. Before he decides, we're liable to see a tactical counterbluff—perhaps some histrionics. He'll scour every nook and cranny of our story, looking for flaws."

Volpone glanced at the chronometer. "We haven't much time for games, Rolfe. I pray he hurries!"

"Sh-h-h, here he comes."

The picture of cultured dignity, Vasili Kirilov resumed his seat as the digital readout tolled 04:55.03.

Emmerson's intuition proved correct. Without preliminaries, but exuding confidence, the ambassador asked, "Gentlemen, do you truly believe it possible to decimate the Union of Soviet Socialist Republics' entire land mass, as well as that of her sister states, with a wave of preemptive thermonuclear strikes?"

"Twice over, Mr. Ambassador." General Patt was stern. "And again in sixty days, yet again in one hundred and twenty days, then yet again in two hundred and forty days."

"Ad infinitum?" Kirilov smiled thinly. "Your undersea forces—those which still exist—have the capability for remaining on subsurface patrol approximately six months, no more."

"During which time they will turn the major portion of your homeland into a sere, radioactive wasteland," said Patt, smiling thinly in turn. "We will then fall back on silo-based ICBM's, aircraft, and . . . and a few surprises."

"Whereupon I predict stalemate," said Kirilov, brows lifted. "My government will be forced to retaliate with thermonuclear weapons. Larger and more powerful ones,

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may I point out, than exist in your arsenal."

"Were that situation to obtain," asserted Emmerson, calm-voiced and assured, "there would be no stalemate, Mr. Ambassador. Our redoubts were designed with such attacks in mind. Even deep-penetrating warheads will fail to destroy more than a handful. Take Denver-Cheyenne, for example; the mass of the Rocky Mountains lies above the installation. Penetration would require blasting away the overlying continental divide.

"No," persisted Emmerson, "what you envision is precisely what we wish to avoid: exhaustive, reciprocal nuclear devastation leading to a global holocaust, and the subsequent demise of civilization."

Ambassador Kirilov acted keenly absorbed, though Volpone thought he seemed ever-so-little taken aback. He became sure they were gaining ground after the ambassador's next question.

"And how long will your redoubts, as you call them, sustain their occupants?"

"Twenty-five years," Volpone heard himself say.

Kirilov swiveled around, almond-shaped dark eyes locked with Volpone's. "That is an incredible length of time, sir. Can you substantiate such an extravagant claim? Your air storage facilities are known to be widely scattered in offshore waters. You will have no access to the air in the event of–"

"Nor do we require access to *that* air," interrupted Volpone triumphantly. "General, can we have M Level's air storage complex on the large video monitor, please?"

General Patt lifted his hand controller, uttering several terse words of direction. In seconds a hologram jelled within the largest tri-di tank. The view was awesome, even in facsimile: a vast, two-mile-long gallery containing monster egg after monster egg cradled in a diminishing, geometrical row. The tanks dwarfed a scattering of human figures riding to-and-fro on slideways in the near distance.

Kirilov stared, obviously impressed, as General Patt said, "We can raise an entire generation of Americans underground if we must. Do we have to, Mr. Ambassador?"

Vasili Kirilov squirmed in his chair.

Noting breathlessly that the man's balding forehead was beaded with a light film of perspiration, Volpone shot a nervous glance at the chronometer. The digital readout stood at 05:04.28.

"Phone, Mr. Emmerson," called the nearer marine noncom. The CIA Director rose, stepping briskly to Patt's desk. He spoke briefly, then caged the handset, looking pleased. "Good news. Dr. Hershkowitz' medical team is on the brink of developing antipneumonic serum. He'll call back as soon as both the treated and control animal

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subjects have undergone suitable tests."

"Hershkowitz?" murmured the Soviet Ambassador. "Where have I heard that name before?"

"Chaim Hershkowitz was chief of medical research in Moscow University until 1983," said Emmerson. "He was expelled from the USSR after being forced to reimburse the Soviet state for his medical education. He is a Jew."

Kirilov heaved a deep sigh. "I suppose," he said resignedly, "there is a certain amount of irony in that." The ambassador ruminated for several seconds. "May I call my superiors, please."

"I think that would be wise." Emmerson stood as if jerked to his feet by invisible wires. "We've made arrangements for conducting you back to your embassy, Mr. Ambassador. Contacting your government from there will be much more desirable; Moscow must understand the call to be solely a matter of your own volition."

"As you will." Kirilov studied Emmerson, his manner reflecting profound respect. "Mate in three moves, Dr. Emmerson; I congratulate you. Might we, perhaps, find time for a game or two while I'm being held in your country?"

"I'll look forward to it, Mr. Ambassador. But you'll have to hurry now; time is critical." In an aside, Emmerson asked Volpone to fetch Major Craft, then returned his attention to Kirilov.

"Tell your government," instructed Emmerson, "that time is essential. General Patt, who is acting Chief of State under martial law, will insist upon a face-to-face meeting as soon as possible. You may choose the site; it's of little consequence to us where the meeting takes place . . ."

Elated, Alex Volpone opened the door, expecting to find Craft waiting outside. A submachine gun muzzle was pressed firmly against his chest.

Volpone edged backwards, hands raised instinctively, too surprised to voice a protest. Behind the man holding the weapon was Major Craft, dressed once more in the protective plastic garment, the bubble of his fishbowl tilted back, his hands held shoulder-high.

Behind Craft, three other men wearing gray jumpsuits also carried weapons, and behind them waddled Senator Raymond Stillworth, brandishing an automatic pistol.

A whiff of stale Bourbon hit Volpone as he retreated into the command center. He felt a sharp twinge of panic; Stillworth looked wild-eyed, dangerous, capable of anything.

"Well, lookee heah what we got—the Rooshian Ambassador an' all his new-found friends. Now ain't that a picture!" Stillworth motioned with his sidearm. Two of his men herded the startled marines into a corner of the chamber. The

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other pair of armed men stationed themselves watchfully near the door, their weapons raised.

General Patt broke the heavy silence after sizing-up Stillworth. "Good evening, Ray," he said pleasantly. "This is an unexpected treat. I take it these men are some of your American Rangers?"

Stillworth chuckled, enjoying himself. "You take it correctly, General, suh. They, an' me, are here to prevent a sell-out."

The command center remained deathly still for several heartbeats. "Ray, I think—" began Emmerson cautiously.

"Shut up! I'll do the thinkin' an' talkin', egghead!" Stillworth glared at the CIA Director, then swung again to face Patt. "General, suh, can I ask a simple, straightforward question, an' get a simple, straightforward answer?"

"What would you like to know?"

"Whether or not you've already sold out your country to this Rooshian pig? That's what I'd like to know."

"Could you be a little clearer, Ray?"

"Sold out, dammit!" Stillworth pointed to the chronometer. "Is our strike still set for six o'clock, or have you consummated a deal with this bloody-handed Red Rooshian bastard? Which is it?"

Patt's face seemed carved from stone. "We are counting-down; the strike will take place as ordered, unless—"

"Unless nothin'! I'm damned glad to see you've retained enough sense of duty to fulfill your obligation to the United States, Patt; to all those sick, dyin', pitiful creatures up there who're dependin' on your guts an' command judgment t'square accounts."

"Thank you," said General Patt dryly.

"Ray, listen; let's sit down and talk it over," suggested Volpone, his throat webbed with cotton.

"No, Mistah Secretary of Transportation, suh, we will not," denied Stillworth with a wolfish grin. "An' I'll thank you t'not interfere again.

"Now then, General; who else, besides yourself, is able to countermand the strike order?"

Patt stood firm, meeting the senator's antagonism head-to-head. "No one, of course. You knew that before you asked. No one, that is, except President Blair himself, or—"

"Who's dead, or dyin'," rasped Stillworth. "So's the Vice President, an' probably the Speaker of the House, as well. Not to mention a few million other good Americans.

"Well, I expect I've found out what I wanted to know, General. Thank you kindly, suh."

Stillworth raised his automatic pistol. The weapon produced tremendous repercussions within the command center's confines as a slug smashed Lieutenant General Michael Patt backward against a communications console.

Patt sagged to the floor like a

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boneless doll. The chronometer tolled 05:09.32—and counting.

XX

May, 1988

"Stand!" Stillworth's hoarse bark arrested Volpone and Emmerson as they moved to aid General Patt. "Stay where you're at, unless you want to join Patt there on the floor."

Volpone's heart pounded almost painfully. His throat was inhumanly dry. "That was cold-blooded and cowardly," he bellowed.

"Cowardly, huh?" Stillworth cocked his head, eyes glazed, voice brittle. "In a minute I'm gonna show you exactly how cowardly I am, Volpone. Nothin' I'd like better, frankly, than t'blow a hole in your hide, too. Just give me any ol' provocation, an' that'll be sufficient. Now sit down, all of you."

Major Craft chose the end seat at the conference table, with Volpone next to him. Emmerson cast one agonized glance at Patt's recumbent form before drawing out a chair for Kirilov. The Soviet Ambassador's features were stoic, emotionless.

"That's better." Stillworth beckoned a pair of Ranger accomplices. "You two; take the marines on outta here an' turn 'em loose. Yeah, it's OK. Then stand watch outside. I figure we got four or five minutes, an' that's all I'll need."

The portly senator faced them, bloodshot eyes lighted with fervor. "Cowardly, y'say? Let's see what you think after I tell—"

"If you've any decency or patriotism left," raged Volpone through gritted teeth, "you'll let us see if we can help the general."

"Forget him," said Stillworth coldly. "Patt's dead. I came here to prevent a sellout, and prevent one I did. You gentlemen—I explicitly disclude that Rooshian pig—have got the wrong idea about me. Stoppin' you from makin' a deal with that blood-soaked butcher sittin' beside you is the most patriotic thing anyone's done since Patrick Henry spoke his piece. What we got, an' are gonna keep, is the best of all possible solutions. It ain't worth botherin' to explain it, but I'm gonna try. You see, we got 'em dead to rights; got 'em on the run. It just ain't the proper time to be thinkin' of makin' deals."

"You're an undertaker," asserted Volpone, "presiding over the death of the world!"

"Then you're gonna be a pallbearer, Volpone. Death, hell!" repudiated Stillworth. "Cain't none of you see that bilateral destruction of America an' the USSR is inevitable? If not here an' now, why then sometime when we won't be sittin' in the catbird seat. American Democracy an' Red Communism are poles apart; they ain't ever gonna live together peaceably on one planet. Never!

"No, siree; thoughts of givin' in,

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negotiatin' with 'em now that we got 'em bent over a king-sized barrel would gag a maggot. We're gonna play it *my* way. We're gonna let go some big ones at six o'clock, then sit back an' sweat out their big ones, then throw a few bigger ones, an' yet bigger ones, an' keep throwin' 'em, by God, till they come crawlin' outta their holes an' beg for mercy!.

"When they do," announced Stillworth, "we're gonna show 'em *their* kind of mercy: the biggest nukes of all—right down the chute. An' when none of 'em are left, we'll wait patiently till we can come out an' build the kind of world it should've been all along—a *free* world!"

"Bravo!" Alessandro Volpone beat his hands together softly in mock applause. "That speech might have earned you a ten-minute ovation at a Ranger convocation, Ray. But I happen to know you're wrong—pitifully, horribly wrong. Human beings will again be living in caves, in your 'free' world, if any should survive."

Stillworth flushed. "Well, we ain't gonna be the ones who'll find out whether I'm right or wrong, Mistah Secretary of Transportation, suh."

"What do you mean?"

"I mean . . ." Stillworth's florid features broke into a sunny smile. "Shucks, I'm a practical man; I got no chance t'run a blazer on a whole damned regiment of US Marines. The only reason it's worked so far is that those marines were drawn up on D Level for inspection by this Rooshian mass-murderer, an' we knew it. They'll be all over us like flies soon's word gets around. Except, by then, it won't matter none.

"Y'see, I propose to open this here redoubt to the outside an' let in the Rooshian bugs. One redoubt's a dirt-cheap price to pay for final victory. Then you fanciful, dreamin' idealists'll find out what it's like to sicken an' die same as the ordinary, workaday Americans topside who didn't have high mucky-muck titles to hide behind, nor deluxe, air-conditioned redoubts to crawl into when the goin' got rough. Maybe when *your* lungs get t'burnin', when you're coughin' your lives away, you'll have a deeper appreciation of what those Communist swine you were tryin' hard to make a deal with have *done* to us."

Regarding them with a pleased smirk, Senator Stillworth asked, "How cowardly do you think ol' Ray is now?"

"Much, much more cowardly than I'd thought," said Volpone, voice cracking with emotion. "Suicide is the coward's last resort. You are like Hitler, pulling his country into the grave after him."

"You will die, too," pointed out Emmerson somberly.

"Sure I'll die, egghead—just another wartime American casualty.

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But not everyone in this redoubt'll die. The Rooshian's immune to the godawful plague he's helped spread across these United States. I *want* the son-of-a-bitch to live to witness the absolute an' total destruction we're gonna visit on Mother Rooshia. That'll make a very fittin' windup to this sorry affair, right enough."

Stillworth stole a quick glance at the chronometer; it stood at 05:12.42 "I expect we'd best cover some ground, boys," he said, waggling the pistol. "On your feet, Craft; you're comin' with us."

Outwardly unsurprised, Lew Craft rose obediently. The remaining pair of American Rangers backed toward the door, their submachine guns in readiness. Senator Stillworth paused before leaving the command center. "Adieu, my sometime friends. One day, if any of you live t'see it, you'll realize ol' Ray Stillworth was right all along."

Volpone, Emmerson, and the Soviet Ambassador returned Stillworth's stare in helpless silence.

The senator shrugged and went out. The doors closed. They heard a security bar being lodged in its slots.

As the padlocks clicked shut outside the command center, the chronometer registered 05:13.01. Volpone rushed to General Patt's side, while Emmerson anxiously switched on the intercom.

"Now then, Major Craft," began Stillworth as they boarded the M Level slideway, two Rangers leading the way, the other pair trailing close behind, "y'saw me shoot General Patt back there, didn't ya?"

Craft looked straight ahead, his face immobile.

Stillworth dug the automatic into his ribs. "Didn't ya?"

"I saw."

"Fine. I shot Patt, even though I considered him a friend of mine, because it badly needed doin'. Have you serious doubts about whether I'll shoot you as dispassionately as I shot Patt? If so, let's hear about 'em now."

"I have no doubts."

"Better an' better; now we're gettin' somewhere. I happen to know that the number one control booth down yonder affords a handy way to bring surface air down here into the redoubt. Y'see, I did my homework. I never claimed to be much of a technical man," continued the senator, "but at least I'm smart enough to understand basic pneumatic diagrams an' operational procedures. We're gonna have us a hand of cards, you an' me. Play poker now and then, do ya, Major?"

"Sometimes," admitted Craft.

Stillworth snickered. "I figured as much. A close-mouthed devil like you always imagines he's a great shakes with the cards. Well, you ain't gonna be allowed to look at my hand, son. You're gonna have

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t'guess just how much I really know about operatin' that air control console. Guess right, an' we'll get the job done. Then you'll be on your own, takin' your chances same as the rest of us. Guess wrong, an' it earns you a quick bullet. Do we understand each other?"

Craft's nod was grim. "Heads you win, tails I lose," he said wryly. "What's the percentage?"

Stillworth half-smiled. "I s'pose you're right, at that," he said. "But who's t'say? Maybe you won't die. You're young, strong, healthy as a tick. What the hell! Open 'er up, an' we'll all take our chances together. We all got to die sometime."

"How about your friends, here?" asked Craft, tipping his head. "How do they feel about dying?" He made his voice loud enough to carry clearly, earning sullen looks from the Rangers behind them.

"Naw, don't mess with Roy, or Les," advised Stillworth. "Roy lost two brothers defendin' Jerusalem in the Mideast War, an' still walks with a limp hisself from a Red Rooshian-made mortar shell.

"Don't tease Les, neither," said Stillworth, jerking his thumb. "He's the tall fella. I call him Les, but his real name's Laszlo Somethin'-or-other. His papa died throwin' rocks at Rooshian tanks in Budapest in 1956. Get my point? These boys are *Americans.* They ain't afraid to die for what they know is right."

Major Craft said nothing.

The lead Rangers stepped from the slideway. Craft, Stillworth, and the other pair followed, walking swiftly across the vast granite floor of M Level in a loose cluster. Stillworth, noticing the chafing, plastic sounds produced by his protective suit, asked Craft if he would like to stop and remove it.

"It doesn't bother me," said Craft, holding up the acrylic bubble of his headpiece with one hand.

"Whatever y'say." Stillworth instructed the Rangers to keep a sharp eye out for intruders on the floor around them. None were in sight at the moment.

The control booth lay atop a fifty-foot-high steel stairway. Catwalks which skirted the enormous, spheroidal pressure vessel, connected its foundation platform to another holding a smaller control booth at the number two station. No compressor was installed in the station they were approaching; it had been removed, reinstalled at a farther station, then eventually shipped to some other site after all local tanks had been fully charged. Two Rangers climbed ahead of them, scanning M Level's floor at each landing. Craft, with the senator wheezing noisily in his ear, sensed how carefully the trailing pair scrutinized his every movement.

Number one station's booth was larger than the others; it had been designed to do double duty both as

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compressor controller, and control point for the complicated manifolding of air lines leading downward from the subsurface air plenum chamber. Stillworth had been right; this, the closest, most convenient place from which to effect his purpose, also offered the least chance of being observed and apprehended.

Craft pondered as he climbed. Strangely, he felt no apprehension, though realizing he would be allowed one shot, and one shot only, at doing what he had in mind. If he failed to be convincing, if Stillworth caught him at it . . . What the hell! Even if it *did* work, hoping to evade the firepower of five armed men was fanciful. Try as he would, he could think of no remotely feasible alternative.

Craft knew he had toyed with oppressive odds in taking a loaded weapon away from Parkinson in the Sacramento-Reno Redoubt last month. He'd been very, very fortunate to get away with it. He did not care to abuse odds like that again, and certainly not the much higher odds he faced now. Trying to disarm wily Senator Stillworth was unthinkable, not to mention his four armed cronies. Besides, the senator was not the relatively easy-going Parkinson. Stillworth was determined, cagey, and had nothing to lose. He would be damned difficult, if not impossible, to overpower *or* outwit.

Poker, huh? Craft considered the thousands of hours he'd squandered playing poker when he should have been doing something else. OK, Senator; let's see what kind of poker player you really are!

The Ranger called Roy unlatched the steel bar and swung the control booth's door half-open, scowling as he allowed Craft to enter first.

The sheet metal compartment was no more than fifteen feet square. A gray console containing four control panels, an operator's chair, and a small desk and second chair took up most of the floor space. Below a girlie calendar, a maze of heavy-walled stainless steel pressure lines ran behind the console along the bulkhead, vanishing into an insignificant bulge forming the booth's right-hand wall—actually the gargantuan air tank's outer face. Inside the pressure vessel, four hundred atmospheres of compressed air lurked like an unfused bomb.

Craft dared a glance upward. The welded snout of the tank's emergency bleed valve protruded inches from the booth's acoustical tile ceiling. He looked away quickly, pretending to push back the bothersome acrylic bubble of his yellow topside suit.

"OK, Craft; ready to open 'er up?"

Craft nodded, taking no pains to conceal his reluctance.

"Dandy!" Stillworth waggled the automatic with authority. "'Cept

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we're gonna do a dry run or two first, so's I can learn which way t'bet—on ya, or agin' ya. This's the only hand you're gonna be dealt; better try an' play it kind of conservative."

Lew Craft rudely scooted the castered operator's chair to one side, forcing the Ranger called Les to spring back out of the way, which earned him a dirty look. He said, "I'll stand, if you don't mind."

"Easy, son; don't get uptight an' ornery. Stand, or sit; no matter to me." The senator took a position close by Craft's shoulder. "Turn the cards over slow-like," he said, "'cause I'm a novice at this here game."

Stillworth and Craft faced the console side by side. One pair of grim-faced Rangers were poised near the desk; the other two stood alertly, their backs to the air tank's outer shell.

"This," said Craft, indicating the uppermost panel, "is the control sequence for inlet gate valves topside, lower plenum valves, and the collection pit's impeller guards. Follow the chains of arrows engraved on the panel and you can find out how to choose feeder lines through which to bring air down . . . here." He pointed to the second panel from the top. "These devices control air line manifolds on M Level. You can select which tanks to charge, and in what order."

"Go on," directed Stillworth with a curt nod.

"The third panel controls number one station's compressor, when one's installed," explained Craft. "We won't need it. The lowermost panel controls and distributes power for motorized valves throughout the system, as well as circuit breakers and overload warning devices.

"First, I'll energize the console by throwing this guarded toggle switch, then put us in manual operations mode by cycling this switchlight, overriding the central computer up on F Level."

"Sounds real good. You're doin' fine, son. Then we start openin' valves to the surface, eh?"

"Um, not yet."

"Why'n hell not? The way's gotta be open for air to come sailin' down those pipes."

"Sure, but the air has to have some specific *destination,*" said Craft bitterly. "Before opening valves, we have to switch from TANK CHARGE SELECT to DISTRIBUTION SELECT. See here?" Craft pointed to a switchlight in the upper left-hand corner of the panel second-from-the-top, stretching in the crinkling plastic suit to reach it.

"Uh-huh," murmured Stillworth uncertainly. "*Then* we open the valves?"

"Right; starting with the manifold valves, here. Then the lower plenum valves, upper plenum valves, and finally a sequence of seven gate valves in each descend-

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ing duct—the radioactive debris baffles."

"An' then?"

Craft shrugged. "Then we crank up the collection pit impellers and B Level blowers and stand by for a breeze."

Senator Stillworth stared hungrily at the console, obviously running through Craft's intended sequence of operation and comparing it in his mind with what he remembered from the procedures manual. He looked at Craft, eyes glowing with distrust. "Go through that there DISTRIBUTION SELECT thing-amajig again, will ya? I don't recollect nothin' like that."

"It's simple," said Craft with complete assurance. "You can select charging lines to any specific compressor station here on M Level, or air diffuser lines to the whole redoubt in general—distribution. The redoubt's air conditioning system drew distribution air for years and years before we sealed up."

Craft looked directly into Stillworth's rheumy eyes, his expression innocent, unchallengable. He had neglected to inform the senator that DISTRIBUTION SELECT referred to whichever pressure vessel the operator chose to draw compressed air *from*—the exact opposite of TANK CHARGE SELECT—though he himself wouldn't know which tank in the line, if any, was activated until he powered-up the console, since the indicator light—the first in a row directly beneath the selector switch—was now inoperative.

He was betting his life on the fact that Stillworth would have to be mighty sharp with unfamiliar equipment to detect the indicator light when the console came to life and it lighted.

"I ain't sure I believe ya, son." The senator looked wary.

"What the hell!" Craft screwed his features into an exasperated grimace. "Check the manual; that's the only way you'll move outside air down here into the redoubt."

"I ain't got the manual with me," said the other, studying Craft with unblinking persistence.

The major gestured angrily toward the desk. "There's probably one in there. Look it up!"

Stillworth's eyes shot toward the desk momentarily. Seemingly satisfied that Craft was willing to let his intended procedure be verified, he chewed his tongue for an instant, then checked his wristwatch. He was beginning to worry about the time.

Stillworth finally made up his mind, pressing the pistol firmly against Craft's rib cage. "Let 'er rip, Craft. But no quick moves or I blow you apart an' finish the job myself. Understood?"

Craft seesawed his chin, almost as if he hadn't heard. He lifted a red dayglo guard and pulled up the detent-captured main power toggle, thumbing it upward into the ON

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position, then released it. The spring-loaded guard snapped down immediately, again covering the switch.

The console's panel-mounted control and display devices lighted promptly; the cooling blowers came on with a soft rush of moving air. Craft's optimism for the "hand" dealt him leaped by a factor of twenty. The indicator light he needed was already cycled to read TANK NO. 1.

"Now we choose manual operations mode," said Craft, depressing an illuminated switch, "and we're ready to select distribution air."

"Make it march, son," directed the senator. "We ain't got all day." He watched Craft's hands intently.

Lew Craft quelled his jumpiness. He leaned to his left and stretched toward the DISTRIBUTION SELECT switchlight. While doing so, he unobtrusively felt for and flicked forward a guarded toggle switch marked EMERGENCY BLEED with his right thumb.

Stillworth, eyes glued on the upper panel, failed to notice.

Craft relaxed completely, as before an opening kickoff. In his mind's eye, he could see the opposing team's kicker approaching the ball, getting nearer, nearer, while the butterflies in his stomach fluttered and chased themselves in panic . . .

He hit the switchlight and slammed down the acrylic bubble over his head in one motion, falling backward away from the senator's handgun.

He never learned whether Stillworth fired or not; a piercing, banshee screech filled the control booth with hellish noise, drowning all other sounds, as the emergency bleed valve vented.

Craft landed on his shoulder, banging the acrylic bubble on the steel floorplates, and rolled to his right. The frightful scream of suddenly liberated six thousand psig compressed air was agonizing, even though dulled by the plastic bubble covering his head.

He threw himself blindly toward the door, noting from the corner of his eye that Stillworth and the Rangers, staggered by the unendurable wall of noise, had dropped their weapons. Clapping both hands over one's ears was an automatic, instinctive survival reflex. Craft had depended on just that—and won!

He had real difficulty shutting the door against suddenly ballooning overpressure within the control booth. He grunted, fighting the agony in his ears, straining with one shoulder against the door, one foot braced on the platform's steel guard rail. With his more-or-less free hand, he brought down the latching bar.

Inches more! Some added resistance appeared as neoprene door seals made contact with those bonded to the jamb, but by then the latching bar had fractionally

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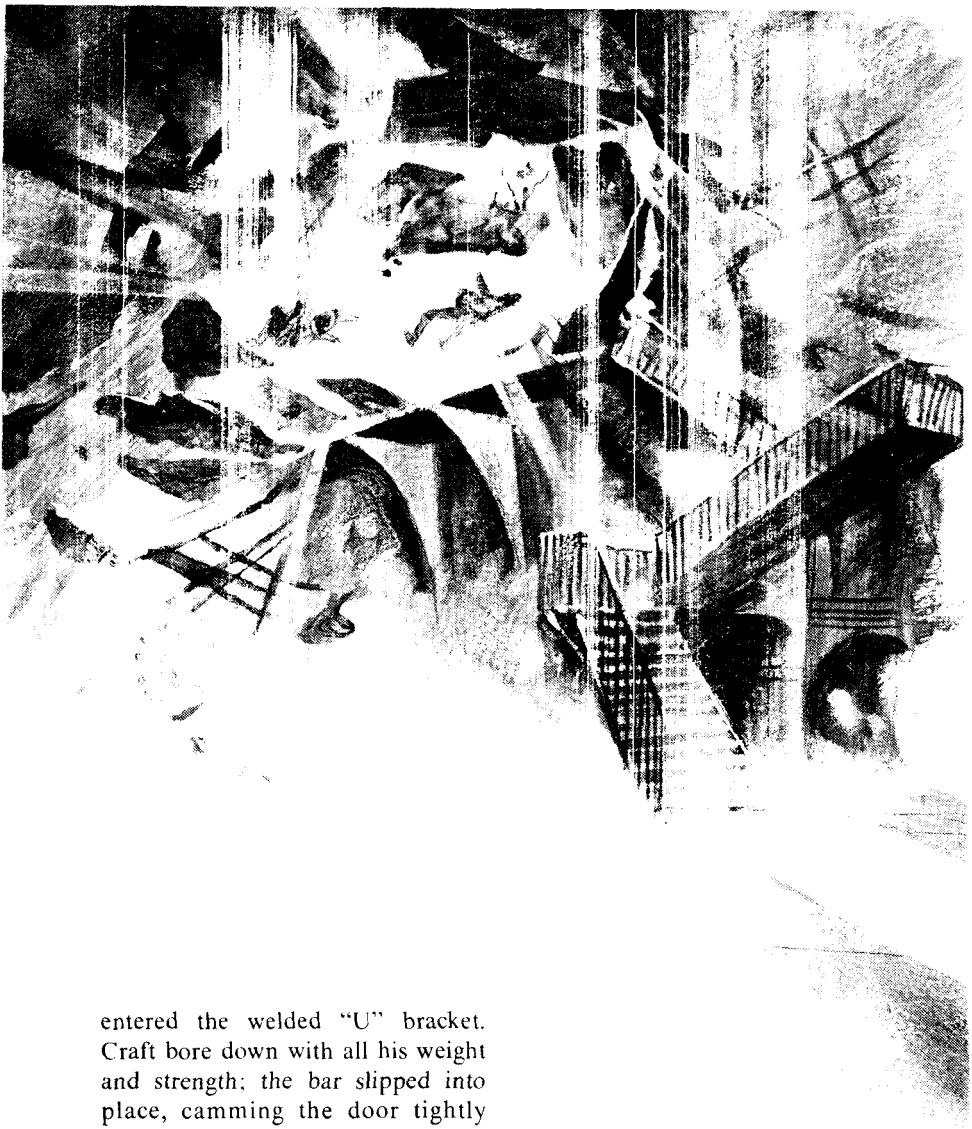

entered the welded "U" bracket. Craft bore down with all his weight and strength; the bar slipped into place, camming the door tightly closed just as something heavy crashed into it from the other side.

He fell to the platform, quivering, then tumbled down the first section of steel stair, hopping to relieve the cramp in his leg.

The stair was a never-ending nightmare of sharp turns. He fi-

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nally gained the floor, sprinting hard for the slideway, glancing backward over his shoulder from time to time as he ran. Ahead, a squad of marines was double-timing up the great hall, running on the slideway for added speed. Craft frantically waved them back, throwing himself prone on the nearer slideway.

He lay there, letting it carry him toward the air storage complex's nearby wall, gaping at the control booth in abject disbelief. The walls were bulging, distending before his eyes.

Silently, as in a slow-motion film, the control booth came apart like a dollhouse. The wall opposite the pressure vessel ripped free to fly in an erratic cartwheel, smashing into the granite face of M Level's air storage gallery. The other wall sections fragmented; warped sheet metal pieces rained to the stone floor, some missing Craft by scant feet. The roof followed in twisted sections, among them the

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console, desk, and several loose-limbed mannequins.

Totally absorbed in the spectacle, Craft stumbled from the slideway when it disappeared into the floor at its terminus near the elevator alcove.

"Call and raise, Senator," he mumbled to himself.

Face suddenly contorted, Craft clutched at the fishbowl covering his head, shouting inanely. Nothing! He couldn't hear a sound!

He paused for an instant, searching out the bloody huddle of flesh that had once been a United States Senator, then jumped aboard the other slideway, riding back toward the command center.

The marines had heeded his warning, shrinking away from the infernal screech of escaping compressed air. They waited for him, hands pressed firmly over their ears, joining him as he came abreast of them on the slideway.

Craft recognized the lance corporal who had accompanied him to the Sino-Sov Embassy. The corporal grinned broadly, took one hand from his ear, and thumped Craft's shoulder in jubilation. Another marine yelled something. Craft heard nothing. He lifted the acrylic bubble, pointed to his ears, and shrugged.

A team of medical corpsmen were trundling away a hospital bed bearing General Patt when Craft and the marines reached the command center's alcove. Patt's face was uncovered, which surprised Craft, who had assumed that he was dead.

Alessandro Volpone spotted Craft first, bounding forward to pump his hand, his lips working. Emmerson and the Soviet Ambassador were right behind him. For some reason, Kirilov seemed especially glad to see him.

Volpone's lips moved again; Craft could hear absolutely nothing other than the deafening, ringing sound now surging inside his skull.

After the lance corporal told Volpone something, the Secretary of Transportation whirled and plucked a pad and pencil from Patt's desktop. He scrawled a note and passed it to Craft. It read, "Patt conscious for a while—delegated authority over network. SAC now in one hour hold. Archer taking Kirilov back to embassy."

Craft pumped his chin vigorously. "Great!" he said. It sounded like distant thunder inside his head.

Overcome by the relaxing of tensions, Volpone and Emmerson were silently laughing, clapping his back affectionately, when Betty Dancer appeared in the command center's doorway.

With a small sob he could not hear, she flew into his arms.

XXI

May, 1988

The following week passed swiftly in an on-again, off-again

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nightmare of tantalizing uncertainty. Lieutenant General Michael Patt died in C Level's hospital just two hours after Red Archer brought Ambassador Kirilov back from the Sino-Sov Embassy. The Soviet Government had tentatively agreed to a cease-fire, pending a meeting of heads of state. USAF General Boice Clavell, Patt's designated stand-in, concurred at once.

Next day, Moscow, Leningrad, and other major cities in European Russia were mysteriously devastated by further nuclear attacks, throwing the conditional peace agreement up for grabs.

Vasili Kirilov spent the better part of one whole day persuading his government that the United States was not responsible for the surprise attacks. Surviving military elements in China ultimately proved the culprits—a last-ditch effort for revenge, motivated in much the same way as SAC's earlier inadvertent strike against the USSR. After feverish hours of listening to bombastic Soviet threats against her former ally, the summit meeting was re-scheduled to include surviving Chinese leaders.

On the day following the new crisis, Dr. Hershkowitz announced a workable serum for counteracting the pneumonic plague ravaging America. Every redoubt from Florida to Alaska began manufacture of antigen serum with which to start treating the mutilated nation.

That night, at Volpone's insistence, immunized volunteers from the Philadelphia-Allentown Redoubt were sent to succor possible survivors in the New York-Trenton installation, finding a vast subterranean tomb. Only eight thousand commuters had managed to reach "safety" before the redoubt was sealed—too late. Pneumonic plague had entered with them. Of the few handfuls still living, none were saved—including Arne Seymour and Vito Vico.

When told, a shocked, haggard Alessandro Volpone merely grunted, then went right back to work.

On the fifth day problems began multiplying logarithmically. Throughout the country ever growing numbers of immunized survivors defied the standing orders of General Clavell—who feared Soviet duplicity more and more as the redoubts emptied—to go topside and aid their stricken fellows. Misery was universal; water supplies became quickly contaminated, though stored food was still plentiful.

The dead rapidly became a health hazard. Bodies were stacked like cordwood in the streets; huge funeral pyres lighted the night in a thousand cities and towns. Pestilence abounded. In a nationwide morass of human suffering, nothing seemed worth saving.

First, rough casualty figures indicated that between forty-five and

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fifty million Americans had perished, with many more dying every hour. The United States, having absorbed a very punishing body blow, had somehow managed to exercise restraint, to hold back its terrifying retaliatory punch. People everywhere demanded to know why. The answer, when given, was not a simple one, nor did it satisfy an aroused citizenry busy burying its dead.

More and more immunized people streamed from the redoubts. As a last resort, General Clavell ordered interdiction. Guards were posted in every redoubt to prohibit further egress; anyone who could prove immunization could enter. None were allowed to leave.

A summit meetingplace mutually agreeable to both the USSR and the United States was finally fixed—Reykjavik, Iceland. Rolfe Emmerson talked with General Clavell more than two hours over the inter-redoubt net just prior to the general's flight to Reykjavik. They wished the general well, asking to be informed of daily progress, then signed off, had a cup of Emmerson's famous coffee together, and went right back to work.

Two days later, still laboring around the clock along with many others, Volpone and Emmerson were trying to sort things out, to find a starting place for reconstruction and rehabilitation amidst all-encompassing chaos. Deep circles under his eyes, Dr. Emmerson pushed away from the communications console, having just spoken to General Clavell's adjutant in Reykjavik. He removed his glasses, pinching the bridge of his nose in weariness. "God, I could sleep standing up!"

Equally tired, Alessandro Volpone felt they had regained some minuscule command over the situation. "Not yet," he said. "Come with me, Rolfe. I have something I've been saving just in case."

"In case what?"

"You'll see."

Too weary to argue, Emmerson trailed Volpone to the slideway with leaden feet, apathetically riding with him up to E Level. Volpone went to his quarters. He took a long, rectangular box from the suitcase he had brought with him into the redoubt.

"Alex," pleaded the CIA Director, "couldn't I just go to my room? I'll fall over if I don't sleep soon."

"This will keep you up only a few minutes longer. Come; indulge my whim."

Emmerson was uncomplaining during the ten minutes it took to locate Major Craft. They found him in the E Level commissary, drinking coffee and conversing quietly with Betty and the Lewellyns.

Senator Lewellyn noticed Volpone and Emmerson enter the

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commissary. Rising slowly, his manner vaguely sarcastic, he said, "Well, this *is* an honor."

"Glasses? Have we any wine glasses?" Volpone demanded, setting his package on the tabletop.

"I doubt it, Mr. Volpone," said Betty. "There are some paper cups on the counter, but . . . *wine* glasses?"

"Excellent, my dear," approved Volpone. "Paper cups are much more appropriate under the circumstances." He bounded to the serving counter, returning with a short stack of paper cups. "Where is Mr. Hanford, by the way? I wish he were here."

Victor Lewellyn glanced at his wristwatch. "Hoo should be landing in Los Angeles about now," he said, "if he makes it."

"If he makes it?" Volpone's brows lifted.

"He's not the best pilot in the world," said Lewellyn. "Hoo got the damn-fool notion that he ought to go look after his people out in California. I couldn't talk him out of it. He hooked a ride to Washington National Airport, where we left the plane last month, saying he'd fly the jet himself."

"I see." Volpone was preoccupied. He carefully withdrew a bottle of 1966 *Dom Perignon Blanc de Blancs* from the box. A silver corkscrew was tied to the bottle's neck with green ribbon. "I've been hoping to find an occasion for opening this," he said in a slow, satisfied manner. "And now we shall."

"Champagne?" Betty looked puzzled. "What, exactly, are we celebrating, Mr. Volpone?"

"A very interesting question, Betty." Lewellyn was grim.

"Senator, Senator; hate me later at your leisure," appeased Volpone. "For the moment, can't we break the spell of gloom long enough to let me propose a toast? Please; we'll all go our separate ways soon, and probably never meet again."

Craft and the others waited in silence as Volpone skewered the cork, twisting it free with a soft pop. Smiling, Volpone poured for them, raising his own paper cup on high.

"To Major Lewis Craft," he said with feeling, "a man of intelligence, heart, and determination! Without him, I'm certain the course of history would have been altered drastically."

"Hear, hear!" Betty became animated. "Hey, I *will* drink to that!" She tasted her champagne, then decided to taste Major Craft. Their kiss was long, mutually enjoyed, earning a scattering of good-natured applause.

"My turn." Senator Lewellyn studied Volpone and Emmerson with an air of challenge. "Here's to the United States of America—bloody and battered, but unbowed!"

That brought forth a ragged cheer.

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"Bravo!" Volpone was unembarrassed to find his eyes misted.

The festive atmosphere withered almost as rapidly as it had been born. Everyone seemed suddenly immersed in his own thoughts.

"Great champagne, Mr. Volpone," said Craft. "Mind if I propose a toast?"

"Certainly, Craft; go ahead," encouraged Volpone.

Craft paused to slosh champagne, then lifted the paper cup. "To Senator Raymond Stillworth!" he said. Draining the champagne in one gulp, he crushed the cup in his hand, tossing it on the tabletop.

"Maybe you think that was in bad taste," said Craft, "since I was directly responsible for the senator's death. I don't. I killed him—and four other pretty good men—because I had to, not because I wanted to. You could call it unpremeditated self-defense, or something.

"Mr. Volpone," he went on, grimacing uncomfortably, "you and Dr. Emmerson came here to celebrate a victory. Don't deny it; I saw it in your eyes. I hate to put a damper on the party, but in my modest opinion the battle's just begun.

"Your 'celebration' smacks of Armistice Day, 1918, V-J and V-E Days in 1945, or celebrations marking the end of the Korean War, Vietnam War, Mideast War—probably the First, Second and Third Punic Wars—and every other miserable goddam war that was ever fought.

"Did those celebrations lead to peace? Well, just long enough for everyone to rearm, yeah. Usually they paved the way for a world council, or equally farsighted international forum of some kind, that met holding aloft the highest possible ideals, then degenerated into a debating society, a sewing-circle of elderly, self-important men."

Craft paused self-consciously. "What got me started, I suppose, is that powerful, influential men like yourselves are going to have a large say in what happens during coming years—tough, critical years. Think back, now and then, to what Senator Stillworth told us there in the command center. 'American Democracy and Red Communism,' he said, 'will never be able to live together peaceably on one planet.' Maybe he was right. We managed to squeak by this time, but *next* time . . .

"Hell, I'm no speechmaker!" Craft took Betty's arm, steering her toward the corridor. "Betty and I have decided to go topside and see if we can help clean up the mess," he said. "Bye."

Stunned by the major's outburst, Volpone called, "But . . . Craft, the guards won't let you leave the redoubt."

Lew Craft turned, his grin almost boyish. "Oh," he assured them, "we'll figure out a way." ■

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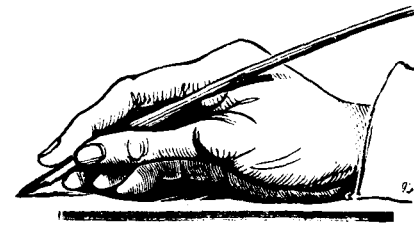

In most scholarly journals,
what you say is
almost as important as
how you say it.

Scholarly Correspondence

Charles Eric Maine

A NOTE ON QUANTIFIED ETHERICS, By D. A. WRIGHT

It is well known that ghosts can penetrate closed doors and internal walls of buildings up to four inches or so (0.1 meter) in thickness. There is some evidence, however, that they remain confined when present in old buildings with an external wall thickness of a foot or more. According to the elementary ideas of wave mechanics (Schrödinger, 1928; de Broglie and Brillouin, 1928) this establishes them as objects whose associated wave functions decrease to 1/2.7 of their full amplitude at about 0.1 meter from their boundary. Their wavelength is therefore of this order of magnitude and their mass at low velocity must be less than that of the electron by a factor of the order of 10^{16}—that is, it must be about 10^{-46} kg.

Evidently, an object of such low mass can be accelerated to high velocity with very little expenditure of energy. Relativistic effects must therefore be considered when dealing with its motion (Einstein, 1905) and it will be understood that velocities such as the escape velocity from the Earth's gravitational field can readily be attained.

The latter velocity is 25,000 mph, or 10 km^{-1}, independent of the

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mass of the object (Newton, 1687). The energy required is only 10^{-38} J. Therefore a breath of wind will more than suffice to start the ghost on a journey through the Solar System, while minor interactions en route could eject it from the Solar System on the way to the stars. The recently discovered solar wind (Cowley, 1969) will suffice to accelerate ghosts to almost the velocity of light away from the Sun's neighborhood.

It is not surprising that in spite of the enormous number of ghosts formed by the demise of *Homo sapiens* alone over the last million years or so, the number of ghosts encountered on the Earth's surface remains small. Admittedly, it is not obvious that *Homo sapiens* is the only source of ghostly objects.

It is likely, however, that all ghost material has extremely low density, so that the ghosts of large objects, both animate and inanimate, will also be dispersed very readily (for example, a collision between two cars recently reported in the press caused one to disappear and no damage to the other; clearly, a ghost car of very low mass was involved). However, to pursue this topic would be an unwarrantable digression from the main subject of interest, which is naturally the ghost of human origin (consider, for example, A. Pope, "An Essay on Mankind").

Proceeding with this subject, it is clear that when, for example, a person is pierced with a spear which is not removed, or hanged in chains, his ghost will remain at the spot and haunt it, even though the sad event occurs in the open air. The spears or the chains are real objects of normal mass.

In the absence of such impedimenta, a ghost will, however, rapidly leave the site and, as we have seen, will probably leave the Earth and quite possibly leave the Solar System. However, following death in dungeons, or in the interior of old castles with thick walls and small windows, the escape probability is very low; and even with the small mass we have determined, the ghost will haunt such a habitat for many years. Wearing of armor or dragging chains will, of course, prolong the period enormously. A layer of dust will produce a substantial increase.

It is interesting to note that a ghost will be accelerated to, say, 0.7 times the velocity of light by a very small amount of work, about 10^{-29} J. Its mass is then twice its rest mass (Einstein, 1905) and its wavelength is halved (Schrödinger, 1928, and other authorities). Thus it is *less* able to penetrate a wall or door once its speed has increased substantially.

A ghost in rapid motion in a confined space will therefore be less likely to escape than when moving slowly. It will also be difficult to lo-

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cate. Although its momentum will be small, it will be large enough to displace lightweight objects on collision.

Thus we have an explanation not only of ghosts themselves, but also of the "poltergeist" phenomenon; vases and other light articles will be displaced from shelves in a disconcerting manner, since the presence of high-speed ghosts will be almost impossible to observe directly. Like many so-called elementary particles in physics, their presence can be detected only by the secondary effects they produce (for example, the neutrino, *vide* Pauli, 1933).

Evidently one can in no sense eject such ghosts by the use of violence. Any further increase in an already high velocity will merely make escape more difficult. The only approach, if the presence of a high-speed ghost is deemed undesirable, is to seek to calm it and bring it to rest so that it can glide slowly through the wall.

No doubt the procedure of exorcism is intended to achieve this result, though the details of precisely how this is achieved remain obscure. It follows, incidentally (as will be seen below), that the attempt is best made in near darkness.

It should be realized that the velocity of ghosts due to thermal agitation will be very large at ordinary temperatures in view of their remarkably small mass. Thus, the average energy of 20° C, 3kT/2 (Maxwell, 1860; Boltmann, 1872) will correspond with a velocity near that of light. Few ghosts will be moving slowly enough to be seen, unless they are very cold, or attach themselves to some material object.

When light impinges on the surface of an object it exerts pressure (Maxwell, 1873) and carries momentum. One photon of visible light incident on the surface of a ghost and reflected from it could transfer momentum $2hv/c$, 10^{-27} J s m^{-1} which would cause acceleration to a very high velocity. A ghost which was not loaded, or holding on to some object or person, would be removed rapidly if the walls were thin, or would otherwise display poltergeist phenomena.

Presumably the reflection coefficient of the surface of a ghost must be much less than 100 percent, or it might never be seen at all. No doubt for this reason it appears to be general experience that ghosts are seen only under conditions of poor illumination. To examine a ghost one should not shine a torch at it; a shielded candle is more suitable.

The low mass leads to a very large shift in wavelength $\Delta\lambda$ of radiation incident on a ghost's surface and scattered by it (Compton, 1923). (The value of $\Delta\lambda$ for a mass of 10^{-46} kg can be as large as 10^{4} m,) thus all short-wave radiation such as light, infrared, et cetera, will be scattered at radio frequencies. The scattering of short-wave radiation by ghosts in

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flight throughout the universe will therefore be a major source of cosmic radio noise. Attempts made so far by astronomers to explain this noise have, unfortunately, taken too little account of this contribution.

It has sometimes been thought that ghosts produce a sensation of cold in their environment. This is perhaps to be expected if they have just returned from outer space, where the temperature is believed to be about three degrees absolute (Penzias and Wilson, 1965). It is less obvious why this should occur if they have been resident for some time, as in an old castle (unless, indeed, they have internal means of refrigeration, which seems unlikely, but perhaps not impossible).

If the observation is correct, it implies that ghosts must have quite a high specific heat. This would in turn indicate that in spite of their very low mass they are not structureless objects. It is evidently important to obtain more reliable evidence as to the temperature and specific heat of ghosts (their measurement might constitute a valuable project for final year university students in applied physics).

The concept of a quasiparticle of large area and volume is new to physics, though it does not appear to be excluded *a priori*. Whether such an object would seem to us to be hot or cold when stationary is not by any means obvious; temperature and specific heat of ordinary particles depend on the state of motion.

Thus, even if the observation is correct, it is not certain that ghosts have structure—they might still be elementary particles. Moreover, the observation may be wrong. The impression of cold may be an illusion, or the result of faulty reporting. It is conceivable, for instance, that the observer experiences a sensation of cold through fear, although it is not obvious why such a reaction occurs.

Assuming, however, that the concept of a quasiparticle is applicable, it would then be desirable to investigate their spin properties, which would determine whether they obey the Fermi-Dirac (Fermi, 1916; Dirac, 1926) or the Bose-Einstein (Bose, 1924; Einstein, 1924) statistics. All readers will appreciate the importance of this issue.

It is always desirable in physics, both pure and applied, when a new question emerges to propose an experimental method of obtaining evidence. In this context the behavior of ghosts in a magnetic field would be enlightening.

If ghosts tend to accumulate in any part of the universe, in what the physicist would no doubt call a "sink," and if they can be regarded as particles, they will constitute a "degenerate" or "condensed" population even at very low density (for example, one ghost per meter). The details will, of course, depend on which statistics they obey.

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It is tempting to envisage that in human ghosts (and indeed not only human) a trace of sexual difference is "carried over." This would be represented by the asymmetric wave-functions characteristic of the Fermi-Dirac statistics. Particles obeying these statistical constraints would have half integral spin, and the ultimate state would be one in which ghosts of opposite spin had paired up to occupy the energy states available, each pair in one state. This highly satisfactory disposition from the point of view of the physicist (a mathematician would no doubt refer to it as an "elegant" solution) might well constitute a state of bliss that all ghosts hope to achieve.

Whether there is such a "pool" or "sink," whether these terms are really appropriate for such a state, and where in the universe it is, remain problems which we may solve only in the future. Meanwhile the theory is offered as a contribution to science in coordinating the known facts in the light of existing knowledge. It is not contrary to known facts and suggests lines of inquiry to be pursued in the future. Furthermore, it illuminates an area of human experience that had previously been thought inaccessible to scientific method.

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COMMENT ON WRIGHT'S "ETHERICS," BY D. McILWAIN

I was interested to read Dr. D. A. Wright's thesis on ghosts, but I'm afraid, however, that Dr. Wright has not really been doing his homework, and has rather glossed over his subject, tongue-in-cheek, while quoting authorities ranging from Newton to Einstein in a blithe-spirited throwaway fashion.

There are a number of constraints which demand consideration in any valid examination of psychic phenomena. Dr. Wright categorically defines a ghost as "evidently an object of such low mass that . . ." et cetera. It is at least debatable whether a ghost possesses any mass at all, that is, density in terms of volume related to weight, and more debatable whether it is an "object" as such. Even assuming it were an object of zero mass, then all relevant equations involving mass would inevitably result in zero and invalidate Dr. Wright's entire argument.

However, assuming a ghost to be an "etheric body" of some kind with a mass of the order stated (10^{-46} kg), then very little applied force would be required to accelerate it to the velocity of light, at which point, if one accepts the Lorentz-Fitzgerald contraction effect, not to mention

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Einstein and relativity, the ghost would appear to the observer to contract in the direction of its motion to zero, thus becoming a two-dimensional object.

It will be appreciated that a two-dimensional entity would have no difficulty whatever in passing through a three-dimensional obstacle, just as a three-dimensional entity encounters no difficulty in traversing a four-dimensional continuum (*vide* Hinton, Eddington, Einstein, Schrödinger, Dunne, Asimov, Heinlein, and others).

In simple language, a ghost of virtually zero mass could rapidly accelerate to the speed of light (and perhaps beyond—the limiting velocity of light applies only to the motion of a three-dimensional mass through a four-dimensional continuum). It would thus become not only invisible to the observer but also capable of passing through any obstacle, including a dungeon wall 20 feet or even 100 feet thick.

The energy required to achieve this phenomenon by "self-volition" of the ghost (that is, acceleration from zero to the speed of light in a few microseconds) would have to be absorbed from the environment, and would be appreciable enough to produce a discernible and indeed measurable fall in temperature. (An actual experiment on these lines was carried out and broadcast by the BBC just before World War Two; the site was a haunted rectory and the temperature, recorded by a thermometer, was observed to fall by several degrees during the night, although no ghost was actually observed or photographed.)

Returning to the Lorentz-Fitzgerald effect, the ghost's personal "time clock" would slow to zero, according to the observer, so that the ghost could go on a short journey at the speed of light (or beyond) and return a few minutes later to find that several decades or even centuries had elapsed since its departure. This is simple Einsteinian relativity, but it makes scientific measurements on any particular ghost quite impracticable due to the relatively short span of human life.

It also accounts for the curious fact, overlooked by Dr. Wright, that there are no "new" ghosts on record. All ghosts seem to be old ghosts, usually associated with secluded country mansions, derelict castles and abbeys, et cetera. There has certainly been no evidence of ghostly manifestations in any of the former German concentration camps, for example, despite the multiplicity of potential phantomic material.

Dr. Wright also glides around the fact that virtually all hauntings are associated with violent and tragic death or murder. This implies an emotional content which is not readily measurable by modern scientific instrumentation. It would be helpful if one could find and hold a ghost long enough to attach electrodes to its ethereal head and make a short

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EEG recording (that would be an even better project for final year university students in applied physics).

Recorded phantoms—and make no mistakes, they *do* exist—invariably wear clothing or shrouds, sometimes are chained, and occasionally tuck their severed heads under their arms. The only assumption one can make, therefore, is that the clothing, shrouds, chains, and so on, are also constituted of low or zero mass etheric matter, and that the ghost plus its apparel and accouterments, whether chains or shining armor, are in effect one integral whole.

There is no known record of nude ghosts, and this obviously has nothing to do with the influence of Lord Longford or Mrs. Mary Whitehouse. On the other hand, there *have* been records of ghostly animals in the nude, mainly dogs, and absolutely no records of dogs wearing shrouds or accouterments. I offer no explanation for this curious anomaly, but merely refer the question back to Dr. Wright.

It is worth noting, however, that all decapitated ghosts, whether carrying their heads or not, appear to behave in exactly the same way as capitated ghosts. This would seem to indicate that such etheric bodies can neither see nor hear, or indeed use any of the normal brain-dependent human senses.

Any experimental attempt to measure the physical properties of a ghost must, because of its very low or zero mass, be futile. As in particle physics the experiment inevitably interferes with the object of study, so that one is thrown back upon the well-known uncertainty principle and probability theory. For obvious reasons it would not be possible to spin a ghost in a magnetic field, or even spin a magnetic field around a ghost (unless Dr. Wright has actually tried it). What has been overlooked is the susceptibility of ghosts to gravitation. Since all mass, however small, involves curvature of the space-time continuum, that is, gravity, and since all ghosts (with a few exceptions) appear to have been witnessed at ground level, it is evident that, while moving slowly or motionless, ghosts are indeed subject to gravity.

Naturally a very low mass would sink into the ground very slowly indeed, which would render accurate measurement difficult given the manifestation of a stationary ghost for less than several hours. The extent to which the density of the ground is significant could be determined by arranging for a ghost to materialize on, say, a very thin platform of plastic or other material (perhaps a detergent bubble) raised a few inches or feet above ground level. One could then observe whether the ghost would pass through it in response to the pull of terrestrial gravity.

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If the experiment could be carried out in vacuum, then the ghost, however small its mass, would fall at the accelerating rate of 32 ft/sec^2, allowing for the density of the intervening film platform (which could in any case be instrumentated to measure the phantomic weight). Experiments of this type would, however, be extremely difficult to carry out in practice, ghosts being so unreliably what they are.

It is worth mentioning that ghosts generally appear solo, that is, one at a time (though not always). The implication, however, is that ghosts tend to repel each other as like poles of a magnet. The possibility of ghosts of opposite (attraction) polarity is therefore admissible, and Dr. Wright may indeed be right in introducing the concept of etheric sexual attraction, although one is forced to conclude that the so-called permissive society could extend into the cosmos beyond the decadent three-dimensional physical environment in which we are all forced to live.

One may logically speculate that ghosts of opposite polarity (male and female) would attract each other in large numbers, possibly forming communes many light-years out in space, where Lord Longford and Mrs. Mary Whitehouse cannot castigate them for whatever spinning behavior they get up to (as suggested by Dr. Wright).

The possibility of cosmic radio noise being of ghostly origin is acceptable enough. It cannot be disproved. Indeed, ghostly communes might well account for what we regard today as "radio stars," quite apart from the random radio interference or static generated by individual ghosts in rapid transit from their dead physical bodies to various rendezvous points far out in space.

On one point Dr. Wright appears to be in error. Poltergeist phenomena are invariably associated with a (mentally subnormal) host or nexus which is a source of psychic power, especially when the host is asleep or in a trance-like condition. It is difficult to see how power enough to hurl dishes and furniture, break windows and roofs, and create spontaneous fires—equivalent, perhaps, to a Force 8 gale—could be secured by a virtually massless ghost, whether in slow or rapid motion, even when drawing maximum energy from a human nexus.

Finally, one sure way of determining whether an observed ghost is objective is to "squint" at it, that is, cross one's eyes. If the image doubles, then the ghost is really there. If not, then it is all in the mind, as I suspect are most ghosts.

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the reference library *P. Schuyler Miller*

MEN OF MANY WORLDS

I acknowledge the male chauvinist tone of the title I have used for this column. The ladies were well represented in the academic sector of the Science Fiction Research Association's sixth "Secondary Universe" conference, held at Penn State University on the weekend following the World SF Convention in Toronto (Torcon II). However, Joanna Russ was not able to give her scheduled paper, and although Phyllis Eisenstein was there, she wasn't on the program. The men had to uphold the writers' end of the discussion, and they did it well.

The conference, on "The Writer and Science Fiction," ran in double sessions through parts of four days, from September fourteenth through noon of the seventeenth. There were nineteen sessions in all, if I have counted correctly, and I didn't manage to attend quite half. (The proceedings may be published later, and if so, I'll tell you where to get them.) This will consequently be a highly impressionistic report of what I did hear.

The point of my title is that, of the speakers I heard, the writers stood out. They were not only the people who could speak to the point about what writers do, and can do, and should do—they were the people who showed an awareness and understanding of the world as it is, and the world as it may be. There were exceptions—outstanding exceptions—but by and large the academics were . . . well, academic. The meat of the discussions came from writers like Theodore Sturgeon, James Gunn, Gordon Dickson, Clifford Simak and Jack Williamson (whom I finally met, after years), John Brunner, Frederik Pohl, Roger Zelazny, Jerry Pournelle, and Penn State's own Phil Klass ("William Tenn," when he was a regular contributor to Astounding).

This, it seems to me, is the essence of the "new" science fiction in contrast to what the Gernsback magazines and their imitators and rivals first published, nearly fifty years ago. Jack Williamson commented on this in a panel I chaired (and on which I consequently have no notes), on what he called "The Years of Wonder," when young writers set out to create imaginary worlds with very little knowledge of the real world, or of people. Theodore Sturgeon said of the even earlier Nineteenth Century writers: "They flung me into other worlds, and I liked it there." We all did; and we tried to create other worlds of our own, and to show readers the way into them.

Three great ghosts were omnipresent: John Campbell, Horace Gold of *Galaxy,* and Anthony Boucher of *Fantasy and Science Fiction.*

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They were all three writers who, more importantly, were great editors. As Clifford Simak said, John Campbell was at first the only editor who would "implore, bully and command" writers to boost themselves out of their apprenticeship. Tony Boucher did the same more gently, and for a broader field that included the fantastic. Gold redefined and broadened the field, so that their three magazines developed distinct personalities, and so did the writers they helped. They created molds that were no molds.

Roger Zelazny characterized the science fiction of the 1940's—the "great days" of Astounding—as chess games and chess problems whose rules were the laws of science. In the Fifties, Phil Klass said, writers first became aware that they were no longer writing just to keep magazines on the newsstands. There was a shift from what Zelazny called "optimistic scientism" (science will find a way) to sociological themes, especially in Horace Gold's magazines. The Sixties (still following Zelazny's scheme) were the era of introspection and pessimism—what Brian Aldiss calls "prodromic" stories in his "Billion Year Spree." Now, Zelazny feels, we are in a period where science fiction is synthesizing the modes and moods of the past, with emphasis on the individual. According to David Hartwell of New American Library (whose SF column I discovered as a regular and excellent feature of *Crawdaddy,* the rock magazine), "the Golden Age is now." Gordon Dickson, speaking on the importance of themes in science fiction, went further. The literate mainstream, he contended, has bogged down, while science fiction is still exploring and is dealing with more important themes than the mainstream ever did. "We *are* the mainstream," he said.

I reluctantly pass a very lively and meaty panel in which John Brunner and Jerry Pournelle spoke very much to the point on prediction in science fiction. There were good academic papers, and I want to give credit to a few of the ones I heard. On a purely academic theme, Robert M. Philmus of Loyola University, Montreal, analyzed the seven known versions of H.G. Wells' "Time Machine," and showed how Wells' concepts of men, science and the world changed, and how he developed them in parallel series of articles and in the changing versions of his story. S.C. Fredericks of the University of Indiana showed how science-fiction writers are reviving, reworking and reinterpreting the ancient myths and casting new light on them in the process. David Larson of Franklin and Marshall College showed that literary and scholarly neglect of science fiction (now suddenly reversed) parallels the way in which the intellectual world treated poetry in the Sixteenth Century, and the novel ("Lies!") in the Eighteenth.

"Science fiction is attacked today because it is not safe," Larson said. "The more dynamic it becomes, the more it threatens established values." It is by nature heretical, since it explores all possibilities and the more freely it does so, the more it

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misrepresents both science and society as seen by the current orthodox Establishment. (This is precisely what SF *should* be doing, John Brunner had said earlier in the "prediction" panel–it should assess trends the writers see in our world, it should draw conclusions as to where these trends can lead, and it should dramatize these conclusions.)

Most of us, I think, became aware of a rather serious problem which has arisen with the sudden acceptance of science fiction in the colleges. Where teachers who enjoy science fiction–or who write it (Gunn, Williamson, Klass, and others in special courses)–are giving SF courses, they seem to be sound, valid, and meaty. But too many young instructors are assigned the job of teaching about something they have never read, don't understand, and can't find out about through normal academic channels. The journals of SF scholarship help (the SFRA's *Extrapolation* and others). The academic world is becoming aware of the very tough and valid–and informed–SF criticism in such non-professional journals as Canada's *Riverside Quarterly* and Australia's *Science Fiction Commentary.* Some university libraries are assembling reference collections of science-fiction magazines and books, so that instructors don't have to limit themselves to Wells, "Brave New World," "1984," and Zamiatin's "We." But *the colleges need help.* If a college in your vicinity is trying to teach an SF course, be diplomatic–but help if you can.

THE BEST FROM FANTASY AND SCIENCE FICTION: 20th SERIES

edited by Edward L. Ferman • Doubleday & Co., Garden City, NY • 1973 • 296 pp. • $6.95

I won't go so far as to say that Gary Jennings' "Sooner or Later or Never Never" is worth the price of this gleaning from three years of our respected rival. In fact, I shudder to think of the probable reaction to that hilarious yarn by readers of *SF Commentary,* Australia's highly literate, typically hard-nosed, thoroughly analytical review of world science fiction. (Overdue commercial: I'll be more explicit when I get a chance to read and comment on Bruce Gillespie's gigantic triple issue with a major critical article by Stanislaw Lem.) But in the same volume you get Frederik Pohl's already classic "Shaffery Among the Immortals," with its depiction of the wasteland of fringe *academe* . . . Stephen Tall's "The Bear With the Knot on His Tail," a quite ordinary story that seems better every time I reread it . . . Harlan Ellison's renovation of Genesis in "The Deathbird" (better than any other renovator's version of what really happened in Eden–and after) . . . Phyllis MacLennan's horribly haunting story of a man out of place in "Thus Love Betrays Us" . . . and for very good measure, Poul Anderson's "The Problem of Pain," one of the new series in which the author is exploring the psychology and culture of the Ythrians, the winged folk who are growing increasingly important in his chronicle of the disintegration

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and break-up of galactic society.

These are all stories that I starred when I read this latest in the *F&SF* anthology series. (No. 19, which I somehow passed over in 1972, is out for ninety-five cents as an Ace Book: No. 05458, if that helps your bookseller.) They are by no means all the stories I starred.

There is, for example, Raylyn Moore's "A Different Drummer," in which a deprived child takes over the life of an old maid teacher with a child's cruel ruthlessness. It's a portrait of a stereotype who is also an individual, and a tragic one. There is also Wilma Shore's "Is It the End of the World?" in which a family destroys itself as the world's last oxygen ebbs away. These are "new" science fiction—stories which explore human psychology in a setting of extrapolative themes and environments.

To back off to that marathon first paragraph, you should remember Pohl's "Shaffery" as the astronomer anti-hero who achieves immortality in failure, and Tall's "Bear" as the story of the race that sings a dirge and a plea to the universe, which an appealing research crew answers. In the Jennings story, a missionary with a smattering of Twentieth Century anthropology from Frazer's "Golden Bough" goes into the Australian wasteland with several tons of beads to convert a scraggly band of aborigines by turning their own rain magic back on them. It may be vaudeville, but it's hard to put down.

I have left two fantasies and a minor story about a teleporting troubadour in a past(?) or future(?) feudal society, Phyllis Eisenstein's "Born to Exile." I don't really understand why the story fails to click. The fantasies—the magazine's specialties, but not Analog's—are Alfred Bester's "The Animal Fair," a fascinating yarn about talking animals and a precocious child which is unlike anything you've ever read, and B.L. Keller's "Birdlime," which stretches the generation gap to the breaking point.

And there are five Gahan Wilson cartoons. 'Nuff said?

THE MOON CHILDREN

by Jack Williamson • Berkley Publishing Corp., New York • No. 425-02432 • 208 pp. • 75¢

Now that Murray Leinster and Edmond Hamilton are no longer writing actively, Jack Williamson is in undisputed possession of the trophy for longest career as a practicing SF writer. His first story, "The Metal Man," was in *Amazing Stories* for December 1928—and I took great pleasure in displaying the fragile old issue with its flamboyant cover illustration when I met and introduced the author in September, at the Science Fiction Research Association's "Secondary Universe" conference.

I apologize to you, and to him, for not reading and reporting on the hardback edition of his new book when Putnam published it in 1972. It is certainly the strangest book he has ever written, though I still rate "The Humanoids," based on two classic stories which appeared in Astounding, as his best.

In a sense, "The Moon Children" harks back to the stories

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Williamson first wrote, but he is no longer the New Mexico farm boy of forty-five years ago. In those days, as he said at the "Secondary Universe" panel, the new young SF writers delighted in imagining worlds and trying to make others see them as vividly as they did. In this book he is also creating people as strange as the world in which they live and function.

The "Moon Children"—the superhuman Nick and Kyrie and the furry, seemingly less than human Guy—are born of human parents after their fathers have been somehow contaminated or impregnated with alien life-carriers on the Moon. The book is the story of their tormented and perplexing development, their search for the purpose they sense in their existence, and their battle against human obstinacy and bureaucracy, against their own unknown and contorted destiny, and against attacks or seeming attacks by creatures from other planets, all of them combining to prevent the fulfillment of that unknown purpose.

In the story woven through and around this fairly classic SF theme, nothing is predictable, nothing goes by formula or stereotype. If you thought the final portions of "2001" were veiling a logic just beyond your comprehension, you may find the far more tangible working-out of this book even more difficult to fathom.

The critics and analysts are going to have this book under their microscopes for a long time to come. I am not one of them. But we all need—wasn't it a Sturgeon title, or maybe Lester del Rey's?—"a touch of strange" in our lives from time to time. There are few stranger than this.

NOVA 3

edited by Harry Harrison • Walker and Co., New York • 1973 • 243 pp. • $6.95

The quality of the various anthology series is a direct function of the ability of their editors and the amount of money their publishers allow them to spend. If factors A and B are large, they can attract good stories (C) by good writers (D). So far, Harry Harrison's "Nova" anthologies for Walker have maximized all factors.

As I read the book, I starred five of the thirteen stories. One of the five, Brian Aldiss' "The Expensive Delicate Ship," is a fantasy, but perhaps it can ride through on the shoulders of the "real" SF. It is the story of a man mentally transported to Noah's ark—a sloppy, lubberly hulk which passes another beautiful ship packed with the beasts of mythology. Did the wrong ark survive? Haven't you wondered?

My own favorite as a story is Mack Reynolds' "The Cold War . . . Continued." On one level this is only a formula CIA story transported to the future—but Reynolds' theme, which he first began to develop here some years ago in his "Hassan" series, makes it something to think about. What is the real Third Force that the "underdeveloped" nations must create to counteract the destructive economies of Communism and the West? It's a vigorous story—with meat on the familiar bones.

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Another star goes to Naomi Mitchison's "The Factory," with its gentle comment, "A quiet farm isn't a farm at all . . ." In the Scottish farm of her story, animals and plants begin to die, people are warned away—but the Factory must be thanked for the token jobs it provides for those who can no longer support themselves on the land. It is one of the most devastating ecological stories we have had.

Scott Edelstein's "The Exhibition" is totally different, but it is also a kind of population explosion story. It paints a cruel picture of the artistic pecking order not very far in our future. Philip Jose Farmer, unpredictable as ever, tells what happens when the world begins to lose its memory in "Sketches Among the Ruins of My Mind."

Another story that may get under your skin is Philip Shofner's "Pity the Poor Outdated Man," which illustrates the viciousness of boredom in a world that can recreate unicorns and dragons.

I won't try to set the other stories in any kind of order, except that the last is amusing, but trivial enough to *be* last. Robert Sheckley's "Welcome to the Standard Nightmare" puts a twist into the story of the invincible aliens. Barry Malzberg's "Dreaming and Conversions: Two Rules By Which to Live," offers a pair of vignettes—one mixing psychosis and reality in a way much like his award-winning "Beyond Apollo," the other considering rape and murder as psychotherapy.

Aldiss' "Billion Year Spree" called the 1960's the decade of ecology in science fiction. Then several of these stories come late, including David R. Bunch's "Breakout in Ecol. 2." When the oldsters of tomorrow are still hung up on the ways of their youth, what hangups will today's Jesus freaks, psychedillies, and Earth-dayists develop? And what happens to Zero Population Growth?

Hank Dempsey's "The Defensive Bomber" has become outdated while the book was in press—or has it? An officer in the North Vietnamese air force is smuggled into the United States by activists, so that he can carry the Vietnam War to our own shores. But American civilians know nothing and care nothing about the Geneva conventions. Do we?

Dean McLaughlin is back with a not-too-gentle dig at the academic world in "Endorsement, Personal." This is status won and fame achieved. Norman Spinrad's "The National Pastime" is a football story with a difference. In Combat Football no holds are barred, and the American public loves it!

And it's really not fair to penalize Dick Glass for not doing something he never intended to do. His parody of the pulp super-hero yarns, "The Ultimate End" (an adventure of The Phoenix—and The Salamander) hides broken glass and razor blades in the pseudo-nostalgia. It's just that SF is so broad that you have Aldiss and Reynolds and Mitchison and Malzberg—and Glass—pushed along by the same broom.

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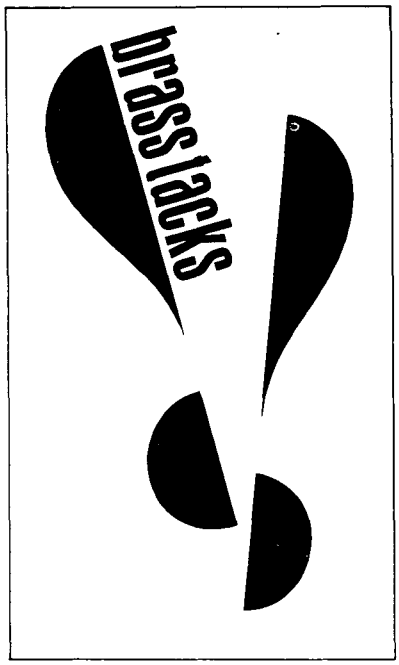

Dear Mr. Bova:

This is an appeal to long-time readers of Analog-Astounding.

I am researching the possibility of doing a definitive article on the Hieronymus invention. To this end I need from readers who have successfully built and demonstrated the machine the following material: (1) a list of parts (precisely defined); (2) complete wiring specs in a schematic (like an amateur radio diagram); (3) a list of successful experiments and how they were performed. In a recent article the writer said that Hieronymus "treated a photo." What I need are specifics. He treated what kind of photo? What size? With a swab? What chemical? Wash the photo? Dry it? Then what? In other words *specifics.*

Any reply will be gratefully acknowledged and the name listed (unless there's an objection) in the list of credits and references. Many thanks to all who respond.

WIRT E. MYERS
5099 Post Road
Riverdale, New York 10471

For years people have reported wildly varying results from home-built models of Hieronymus devices. Perhaps the only way to make sense out of the different claims of success and failure is to compile them carefully, for thorough study.

Dear Ben:

Your editorial "Quis Custodiet . . . ?" (November 1973) literally chilled me as I read it, because it brought up aspects of the Watergate mess that seemed to have been swept by . . . or ignored: the fact that various governmental agencies and the Administration itself are prying more and more into the average citizen's personal and private life and the fact that the government is becoming increasingly more secretive . . .

Hopefully . . . the average citizen can soon acquire the technology to protect himself against the government's technology . . .

NBC ran "The Groundstar Conspiracy" a while back, and a line of George Peppard's still echoes: "If I had my way every bedroom in the country would be bugged."

RAYMOND J. BOWIE, JR.
31 Everett Avenue
Somerville, Massachusetts 02145

How about "bugging" the electronics

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industry to service this new market—the people!

Dear Ben:

I was fascinated by George W. Harper's "Styx and Stones," in the November issue of Analog, and wanted to send along a little tidbit regarding one of his points of discussion.

Since February 18, 1930, when Clyde W. Tombaugh discovered Pluto by use of a blink-comparator—an arduous task made simple by use of today's data processing techniques—there have been speculations about the origin of the planet. In 1936 R. R. Lyttleton proposed that Pluto escaped from Neptune by an inauspicious interaction with the massive moon Triton, and in 1956 G. P. Kuiper concurred, but disagreed with Lyttleton as to the mechanism. In 1972 H. C. Urey reiterated this idea at an ACS symposium, and now Harper has carried on this tradition in his article.

With all due respect to these distinguished and illustrious gentlemen, I say *hogwash*. It is my contention that Pluto is still a satellite of Neptune, for at least two significant reasons. Any good, conventional satellite will have a perihelion within the orbit of that of its primary, and Pluto satisfies this requirement. It crossed inside the orbit of Neptune in July 1969, and will remain within this area until after the turn of the century.

Two, a satellite will nominally have a small-integer fraction relationship with its primary, and again Pluto and Neptune satisfy this parameter. In 1965 C. J. Cohen and E. C. Hubbard showed that Neptune makes three orbits while Pluto makes two in their revolutions about the Sun, and hence are in a 3/2 phase lock. They apparently are in a noncollision equilibrium, and indeed never approach each other closer than about 18 astronomical units (Cf: Astron J *70*, 10, 1965).

It would be desirable for there to be a third reason, as any thesis—like a table—is far more stable with three legs to stand on. Perhaps among your readership there may be some thoughts about additional parameters to either support or refute my contention.

Regarding Harper's hypothesis that there may be a whole pot-load of planetary-sized bodies as well as extensive flotsam and jetsam beyond the orbital aphelion of Pluto, I shouldn't be surprised. Using our own Asteroid Belt as an indication of what might lie out there, and if the Bode-Titius rule has any intrinsic significance, all the proposed proto-planetary debris may be distributed into discrete zones.

I had an occasion to chat with Dr. J. L. Brady, of UC's Lawrence Livermore Laboratory (formerly Lawrence Radiation Lab, to distinguish it from the Lawrence Berkeley Lab, both of which were called LRL), and inquire what happened to the Planet X he and Dr. Carpenter statistically pinpointed. He didn't sound too chagrined that it hadn't been found, because of the degree of uncertainty which one invariably runs into in such matters. Planet X may be 300 Earth masses

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at 60 AU distance from the Sun, according to Brady, or it may be a far more massive burnt-out cinder of a white dwarf star some 600 or more AU that may be merely passing our Solar System by without orbiting at all, except in a hyperbolic path.

There had already been a number of names put forth for Planet X in case it was found, most of which followed the tradition of naming after ancient deities. In keeping with this, I suggested *Erebus,* the ancient god of baleful space over which souls traveled on their way to Hades. However, this is all meaningless space-gas, as nothing yet has been found.

FREDERIC B. JUENEMAN
Innovative Concepts Associates
1441 Stockbridge Drive
San Jose, California 95130

Calling Pluto a satellite of Neptune seems to stretch the standard definition of a satellite. But almost everything we know about Pluto seems strange.

Dear Mr. Bova:

Most stories are just conflicts: man versus man, man versus machine, man versus environment, et cetera. Every now and then though, a writer can make that man become a person, and the result is a good piece of writing.

That's what "We Are Very Happy Here" is (November 1973). He lets his protagonist, Sgt. Mandella, be a person. And since he is a person he can make up his own mind. He makes decisions . . .

My congratulations to Mr. Haldeman for a most interesting reading experience. May he write another sequel soon.

DAVID TAGGART
Chandler Road
White River Junction,
Vermont 05001

Dear Sir:

Belatedly, I just wanted to say how much I appreciated "Epicycle" by P. J. Plauger, in your November 1973 issue. The story was a masterpiece in my opinion . . . I learned more about orbital mechanics in that little gem than I've known all my life! But the biggest kick was the total immersion I experienced in the character of Ms. Dixon. I lived her life, yearned for her goals, and marveled at her superior, yet human, intellect and excellence of ability.

When she finally got her chance to break out her F4 Newtonian . . . "and there wasn't a cloud in the sky," I literally choked with joy . . . fantastic!

However, I happen to be one of those "male chauvinists" that gave the story its necessary tension and conflict. I could not tell from the author's initials whether it is a "he" or a "she" . . .

Is the author the same sex as the heroine?

BURTON H. WOODSIDE, JR.
3576 Warren Road
Cleveland, Ohio 44111

P. J. Plauger is a male. And more of his stories—and Haldeman's—are on the way.

Dear Mr. Bova:

It is good to see a small part of the women's lib message filtering

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down to science fiction; I refer to P. J. Plauger's "Epicycle," in the November 1973 issue. The story is particularly admirable in that the sex of the hero is not allowed to interfere with the telling of the story and is not mentioned in the little introductory comment. Yet there is a certain amount of self-consciousness. Perhaps the story was written by a man? Or perhaps the writer is not yet completely comfortable with these ideas, as might be reflected by the use of the initials instead of a first name. Other female authors have treated their female heroes with more ease, but never that I have read in so difficult a role. NASA's astronauts are male by tradition, so it is harder to visualize a woman in this role than in roles set farther in the unpredictable future. As a woman interested in astrophysics I can see the barriers set up before a woman with a desire to be an astronaut, and Plauger has shown one way in which it might be done . . .

This was a good issue, rather a relief after the excessive numbers of stories you've published lately which build up to a cliché in the last line. I liked Joe Haldeman's continuation, "We Are Very Happy Here," even better than I liked "Hero." And congratulations on a sane editorial on Watergate, something very few people can keep their cool about. I would hope that idealism is not as futile as you imply, but I'm glad it doesn't have to try to pull us out of this mess by itself. Yet I still worry. Have you heard the theory, which sources who ought to know refuse to confirm or deny, that the cause of the decline in Federal support for research—cancer research in particular—is that Haldeman, Ehrlichman, and the head of HEW are Christian Scientists?

PAMELA MACK
90 Walker Street
Cambridge, Massachusetts 02138

And the reason the Defense budget is going up is that Nixon is a Quaker? There's enough craziness in the facts surrounding Watergate without inventing new rumors.

Dear Mr. Bova:

When I got my November issue and hit the story "Epicycle" by P. J. Plauger, I nearly hit the ceiling.

My dear Mr. (or Ms., as the case may be) Plauger, you maligned nearly a million fine, upright human beings when you brought out the stereotype of the semiliterate reading a comic book. I am far from semiliterate, and so are my friends, many of whom read and collect comic books, as I do. It is because of stereotypes like Scott that many adults are too embarrassed to buy comics openly, and send their young children, or their kid brothers, out to make the purchase for them. "You read comic books?" followed by a low chuckle and a patronizing look, has too often been the comment received from others with the same ideas you have.

Comic books, for the most part, have long since passed the age of comedy. There are still those "funny books" that are funny, but these are written for the enjoyment of the under-ten group. Many of

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the most popular comic magazines, such as the National Periodical and Marvel groups, are highly literate, well-drawn, and impossible to be fully enjoyed by the likes of Scott. And regardless of equal opportunity education and training, I doubt that adults who still read—and move their lips while doing so—the under-ten funny books would be allowed in a spacecraft other than as a passenger.

Attendance at recent comic-book conventions has reached several thousand, all of whom are as fairly intelligent and sane as those attending the World SF cons. Perhaps even more so. Such names as Simon, Kirby, Adams, and Kubert are as much revered as Asimov, Heinlein, Bradbury, and Bova. Many of the terms used in SF cons, particularly FIAWOL and FIJAGH, are very applicable to comicons.

The time has passed when a comic book reader could be looked down upon as dumb, semiliterate, or just plain inferior. Those who write the stories and draw the pictures are authors and artists in their own right, and should no longer be asked when they are going to get a job. Friend Plauger, I suggest that you go out and buy an issue of *Batman*, *Captain America*, *Superman*, *The Avengers*, or another of this type, and read it. Study the story line. Analyze the personalities of the characters that are developed in perhaps twelve pages of words and pictures. Examine the quality of the artwork. See how they have changed from the "comic" to the serious.

Aside from the comic book idea, the story was very good.

GORDON H. SCHNAPER
69 Pagoda Circle
Milton, Massachusetts 02187

Although much of the material in the "comics" is no longer comical, it is not yet very deep in characterization, plot, background or social impact. The comic-book form is much more limiting—and therefore limited—than other forms of published fiction.

Dear Mr. Bova:

In the many years that I have been reading Astounding/Analog, I have never felt compelled to write a letter to the editor. John Campbell frequently outraged my liberal (and emotional) sensibilities but his words always came as a dash of cold water and a challenge to logic, reason, and common sense—all of which I hold dear. Occasionally your authors bother me a bit (or a lot), as did "Soldier's Home" in December, which presented, to my mind, an unthinkingly biased concept of the recent decade's furor and a peculiarly misplaced faith in the power of the Pentagon, of all things, to protect us from the alleged devil of Communism.

But I suppose I am naïve, for I was shocked—stung to comment and correspondence—by the letters relating to the August editorial on evolution. In my insular New Hampshire way, I had assumed that virtually everyone—especially those with the kind of mind and imagination I would expect to find in an Analog reader—had grasped the intuitively obvious validity of

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the theory of evolution (whether precisely as Darwin formulated it or with the modifications of later theorists, philosophers and researchers). I am, for instance, dumbfounded that a PhD from any respectable campus in the United States could subscribe to the sort of fundamentalist approach evidenced by one letter in the December issue, or that a man capable of writing a literate defense of the "universal law of The Fixity of The Species" can exist anywhere today . . .

I would like to think that the California Board of Education's decision with regard to the teaching of evolution would become a national laughingstock; evidence to the contrary chills my Cro-Magnon bones and leads me to thank a nonexistent God that our own pre-Victorian Governor, Meldrim Thomson, has not as yet tried to foist a similar ruling on the tormented state of New Hampshire.

PHILIP PRICE
Nelson Star Route
Keene, New Hampshire 03431

Perkins' story dealt with the threat of another nation—it had nothing to do with Communism. And the fundamentalists' attack on evolution apparently has nothing to do with evidence or logic.

Dear Mr. Bova:

I'm a relative newcomer to Analog and, until now, I've considered the readers of this magazine to be imaginative, to possess an above average IQ and to be open-minded. I had no concrete basis to go on for this idea, just an intuitive feeling. But now, as did Ms. Jo Anne Silbernagle (August 1973 Brass Tacks), I also ask the question, "What kind of company am I keeping as a science-fiction fan?"

I now know that I was wrong about at least a few of the readers. I refer specifically to the letters from J. Disbrow, H. Eason, N. Johnson, D. Odom, and L. Winton in the December issue. Those letters are as good an example of studied ignorance as I have ever seen . . . I get the impression from these letters and other creationist literature that these people are either so tremendously conceited that they take evolution as a personal affront without reason or comprehension, or that they are so unsure of their belief that they must attack evolution to buttress their own position . . .

Mr. Disbrow complained that homonid bone fragments reveal nothing to a physical anthropologist. That's like saying a fender off a car reveals nothing to a mechanic about that car. The mechanic would have an idea of what the car looked like, when it was made, and how it ran, even if he had never seen that make of car . . .

Mr. Disbrow spoke of the "universal law of The Fixity of The Species." To what species was he referring? The law of The Fixity of Species was an essential part of the medieval *Scala Natura*. There are two ideas involved in Fixity which are erroneous and, therefore, invalidate the concept. The *Scala Natura* dictated that no extinctions could occur and that all organisms remain as they were created (*i.e.*,

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that they don't vary). The realization of what fossils were invalidates the first idea (show me a living trilobite or ammonite) and common sense *should* invalidate the second. However, consider the different breeds of dog. If that isn't variation I'll be a creationist's uncle. I suggest he look into "Darwin's Century" by Loren Eisley. He goes on to state that the Cro-Magnon and Neanderthal men were just as human as today's *Homo sapiens*. Could that possibly be, cultural differences aside, because they are *Homo sapiens*? Then the Piltdown man is pounced upon as if it proves something. What point was he trying to make? I will offer three bits of information about *Eoanthropus dawsoni* which the creationists seem to overlook:

1. Not all anthropologists accepted the Piltdown man.

2. It was a hoax on science by an individual and not a hoax on creationism by science.

3. *It wasn't the anti-evolutionists that exposed the hoax.*

Finally, Mr. Disbrow asserted that anthropology, biology, and geology ". . . are rife with distortions, misrepresentations, and outright fraud . . ." Other than the Piltdown man, what are some others? Please, please, please, specify.

Mr. Eason spoke of evolution as being unproven. I don't know his definition of evolution or even how to approach his problem. He might try reading Alan Moorehead's book, "Darwin and the Beagle." It is nontechnical and printed in large type . . .

Mr. Johnson, in his letter, objected to teaching about the phlogiston theory and the Ptolemaic Solar System because they have been scientifically proven to be false. I believe it is valuable to teach about them to illustrate the scientific method, and as an important part of the history of science. He then asserted that the theory of evolution and the theory (*sic*) of divine creation should be taught because they cannot be proven false. Is that the only basis for teaching a subject?

A theory, by definition, has a basis in fact and can be tested. The biblical account of creation cannot be tested and, therefore, cannot be considered a theory. Although it is commendatory to believe in the biblical account of creation in spite of a lack of evidence, this same belief, if applied to evolution, is a no-no. This double standard seems somewhat peculiar to me . . .

Mr. Johnson claims stupidity when it comes to understanding the "overwhelming weight of evidence in favor of evolution." I would have claimed ignorance, but I will bow to his self-judgment in this case. Again I ask: what will be acceptable as proof. . . ?

I beg to differ with Mr. Winton when he states, "The trouble is that most evolutionists argue with themselves and do not bother to find out what a creationist believes, other than what he has been told by his biology teacher." Having been in the field of biology for the past ten years it has been my experience that many biologists are well aware of the creationist point-of-view. Admittedly, some are not.

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My own library of creationist literature is fairly large and I add to it when I can in spite of the repetitious nature of the material. As far as arguments are concerned I need to know what Mr. Winton was talking about. The subject of creationism infrequently comes up during bull sessions but there's no argument involved. Also, all scientists discuss their work with their colleagues. It is necessary to get other opinions on a subject to make sure it has been tested thoroughly. I find little validity in his claim, from first-hand experience.

In a spirit of fairness I will recommend one book on the anti-evolution side of the ledger. There are other booklets and various papers, but for the most part they are abbreviated versions of the book, "Did Man Get Here by Evolution or by Creation?" It is published by the Watch Tower Bible and Tract Society of Pennsylvania. The author is not given. This book presents the most complete and up-to-date anti-evolution argument I have found and is well worth reading.

I will end this letter with one parting thought. If Genesis is taught in public schools, will that open the door for evolution to be preached from the pulpit?

BRIAN D. GREGORY
2040 Sidney
Port Orchard, Washington 98366

Most of the people who favor the creationist point of view try to prove their point by attacking the concept of evolution. They have yet to present any evidence supporting their viewpoint. Faith is fine—but you can't use faith to disprove evidence, just as you can't prove a point by shouting louder.

EDITORIAL *continued from page 9*

business got into a crisis situation.

In 1959 I went to work for the Avco Everett Research Laboratory, mainly to help publicize their research in a new technique of generating electrical power, called magnetohydrodynamics (MHD).

At that time, a combination of several electric utility companies and Avco Corporation had decided that the nation's growing demand for electrical energy meant that new and more efficient power generation technology was vitally needed.

It was known then—in 1959!—that the United States' demand for electricity was growing at a rate that doubled the demand every ten years. Forecasters were showing that the standard technology would not be able to keep up with the demand. The goal of the MHD program was to have working MHD power generators on the line in the 1970's.

Without going into details on how an MHD generator works (I wrote an article on the subject that appeared in the May 1965 Analog), the main point is that an MHD power plant would be at least fifty percent more efficient than a stan-

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dard power plant. The MHD process would use fossil fuel, and produce fifty percent more electrical power per kilogram of coal, oil or gas than the fossil-fueled (or nuclear) power plants we are still using today.

The power companies loudly proclaimed that this was one research program that good ol' private enterprise was going to handle by itself. Uncle Sam wasn't going to get his sticky fingers on this baby, as he did in the nuclear business.

By the middle 1960's, the MHD process had been tested well enough so that Avco was ready to build a pilot power plant. Cost, about thirty million dollars. Suddenly Uncle Sam was the power companies' favorite relative. They declined to risk that much of their own money, and tried to get the Federal Government to make the investment.

The Federal Government was preoccupied with Vietnam and other problems, and didn't care about MHD or energy problems. The pilot plant got built, all right. And it's operating right now. In Moscow.

It wasn't until 1970 that Avco was able to put together a combination of Federal and industrial support to get moving again on MHD. During those five wasted years, a good deal of the oomph went out of the MHD research effort. Technical teams don't mothball easily. People left the program and got interested in other areas. The MHD effort is now at just about the place it would have been in, say, 1965—thanks to the foresight of the electric utilities' managements and the US Department of the Interior's experts.

That kind of thinking—or actually, lack of thinking—is the real reason for the energy crisis. There is no shortage of resources. There is no lack of technological skill. There has been a lack of interest both in industry and government in doing anything to head off the problem. Of course, now that the dam has burst, the barn's burned down, and the wolf's inside the door, everyone is following the classic response pattern of panic:

"When in trouble or in doubt, run in circles, scream and shout."

What needs to be done seems both clear and relatively straightforward. We must:

1. Develop new sources of energy that don't require fossil fuels. From steam power to thermonuclear fusion, we should be pushing on *all* practical ideas.

2. Utilize nuclear energy much more fully. Most of the hold-up in fission power has been due to the public's concern about radiation hazards and thermal pollution of water. Both these problems are solvable by proper application of known technology, *and an absolutely honest policy of public relations.* The people will support fis-

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sion power plants once they are convinced that they are safe and won't destroy the local water resources.

3. Our own deposits of fossil fuels should be utilized, with as little harm to the environment as possible. Strip mining can devastate a landscape, true enough. But it may be possible either to get the coal in other ways or to reclaim the landscape after the mining operations have moved on. Moreover, it's technologically possible to convert high-sulfur coal into a cleaner fuel, such as natural gas. These environmental protection steps will be expensive, but they could be funded jointly out of the oil companies' excessive profits and public taxes.

4. Most importantly, we must obtain the leadership and sense of direction that is so conspicuously lacking at the moment. The Space Race was won the moment that John F. Kennedy decided to focus our efforts on putting a man on the Moon. Regardless of why he came to that conclusion, once he established the goal, we quickly outstripped the Russians and turned a once-scary situation into a no-contest.

It's grimly ironic that the scientists and engineers, who have been abused both by the radical left and the conservative right, who have had their funding slashed and their laboratories closed, who have been pilloried for being tools of the Pentagon and impractical eggheads—the scientists and engineers are the ones who will actually pull us out of the energy crisis.

It may take ten years, although the results of a really strong, vital program will begin to be felt much sooner than that. The White House is currently planning to spend ten billion dollars over the next five years on energy research and development. Dollar numbers in the Nixon Administration don't always mean a lot, because many games are played with such figures. But it seems clear that what's needed is more like a hundred billion dollars over the next ten years.

That would be an annual rate of funding about twice the size of the space program in its heyday. Considering the effects of inflation and the seriousness of the problem, that figure isn't extravagant.

We have the resources, the talent, the technology to solve the energy crisis. The question is, do we have the guts, the heart, the leadership, the will to get the job done?

Returning to Patrick Henry, he answered his own question in the same speech: "Sir, we are not weak, if we make a proper use of the means which the God of nature has placed in our power. . . . The battle, sir, is not to the strong alone; it is to the vigilant, the active, the brave."

Can you *imagine* what fiery Patrick would be doing in Washington today? THE EDITOR

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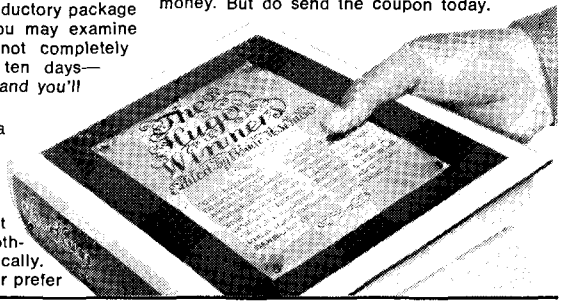

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